TORO®

LCE Products

Mid-Size Walk Behind
Service Manual

ABOUT THIS MANUAL

This manual was written for the service technician; basic mechanical/electrical skills are assumed. The Table of Contents lists the systems and the related topics covered in this manual. The Toro Company has made every effort to make the information in this manual complete and correct.

For service information specific to the engines used on these products, refer to the appropriate engine manufacturer's service and repair instructions.

Additional resources:

- Interactive Electrical Troubleshooting CD (PN 492-4757).
- Interactive Hydraulic Troubleshooting CD (PN 492-4777).
- Hydro-Gear Hydraulic Pump Service and Repair Manual (PN 492-4749).
- Ross Wheel Motor Service and Repair Manual (PN 492-4753).

We hope you will find this manual a valuable addition to your service shop. If you have any questions or comments regarding this manual, please contact us at the following address:

The Toro Company
Landscape Contractors Equipment Division
8111 Lyndale Avenue South
Bloomington, MN 55420

The Toro Company reserves the right to change product specifications or this manual without notice.

Copyright© All Rights Reserved
©2004 The Toro Company

TABLE OF CONTENTS

Safety Information

General Information . . . . . 1 - 1
Think Safety First . . . . . 1 - 1

Specifications & Maintenance

Torque Specifications . . . . . 2 - 1
Standard Torque for Dry, Zinc Plated, and Steel Fasteners (Inch Series) . . . . . 2 - 2
Standard Torque for Dry, Zinc, and Steel Fasteners (Metric Fasteners) . . . . . 2 - 3
Other Torque Specifications . . . . . 2 - 4
Equivalents and Conversions . . . . . 2 - 5
Product Specifications . . . . . 2 - 7
Product Dimensions . . . . . 2 - 10
Model ID . . . . . 2 - 15
Maintenance Schedule, Floating Deck Models . . . . . 2 - 16
Maintenance Schedule, Fixed Deck Models . . . . . 2 - 17

Engine

Engine Removal . . . . . 3 - 1
Engine Installation . . . . . 3 - 5
Engine Assembly, Typical . . . . . 3 - 6

Chassis

Model and Serial Number Location . . . . . 4 - 1
Engine Model and Serial Number Identification . . . . . 4 - 1
Greasing and Lubrication . . . . . 4 - 1
Cleaning the Cooling System . . . . . 4 - 2
Brake Service . . . . . 4 - 3
Pistol Grip - Gear Drive - Fixed Deck . . . . . 4 - 3
Pistol Grip - Gear Drive - Floating Deck . . . . . 4 - 3
Pistol Grip - Hydro - Fixed Deck . . . . . 4 - 5
Pistol Grip - Hydro - Floating Deck . . . . . 4 - 5
T-Bar - Gear Drive - Fixed Deck . . . . . 4 - 6
T-Bar - Gear Drive - Floating Deck . . . . . 4 - 7
Brake Band (T-Bar - Gear Drive) . . . . . 4 - 8

TABLE OF CONTENTS

Chassis *(cont'd)*

Drum Brake / Pulley Assembly Removal (Gear Drive) . . . . . 4 - 12
Parking Brake Linkage (Pistol Grip Hydro) . . . . . 4 - 16
Fuel Tank Service . . . . . 4 - 19
Electric (PTO) Clutch (Floating Deck Models) . . . . . 4 - 20
Replacing the Drive Belt (Gear Drive - Floating Deck) . . . . . 4 - 21
Replacing the Drive Belt (Fixed Deck Pistol Grip) . . . . . 4 - 21
Replacing the Traction Belt (Floating Deck) . . . . . 4 - 22
Replacing the Traction Belt (Fixed Deck) . . . . . 4 - 22
Adjusting Grass/Mud Scraper . . . . . 4 - 23

Hydraulic Drive Systems

Hydraulic Drive System Overview . . . . . 5 - 1
Servicing the Hydraulic System . . . . . 5 - 3
By-Pass Valve (T-Bar) . . . . . 5 - 6
Neutral Adjustment (T-Bar Floating Deck) . . . . . 5 - 7
Handle and Control Rods (T-Bar Floating Deck) . . . . . 5 - 7
Install Control Rods . . . . . 5 - 8
Hydro Linkage Adjustments (Pistol Grip Floating Deck) . . . . . 5 - 10
Speed Control Linkage (Pistol Grip Floating Deck) . . . . . 5 - 10
Neutral Control Linkage Adjustment (Pistol Grip Floating Deck) . . . . . 5 - 11
Hydro Control Linkage Adjustment (Pistol Grip Floating Deck) . . . . . 5 - 12
Control Rod Adjustment (Pistol Grip Floating Deck) . . . . . 5 - 14
Tracking Adjustment . . . . . 5 - 15
Motion Control Linkage Removal (Pistol Grip Floating Deck) . . . . . 5 - 15
Hydraulic Testing . . . . . 5 - 23
Wheel Motor Removal and Installation - Floating Deck . . . . . 5 - 25
Wheel Motor Removal - Fixed Deck . . . . . 5 - 26
Wheel Motor Installation . . . . . 5 - 26
Pump Removal . . . . . 5 - 27

Gear Drive Transmission

Transmission Removal - Gear Drive . . . . . 6 - 1
Control Linkage Removal (T-Bar) . . . . . 6 - 5
Control Linkage Adjustment (T-Bar Gear Drive) . . . . . 6 - 6
Installing the Control Rods . . . . . 6 - 7

TABLE OF CONTENTS

Mower Decks

Setting Up the Frame (Floating Deck) . . . . . 7 - 1
Checking the Deck Level Side-to-Side (Floating Deck) . . . . . 7 - 2
Checking the Deck Front-to-Rear Blade Slope (Floating Deck) . . . . . 7 - 3
Adjusting the Deck Front-to-Rear Blade Slope . . . . . 7 - 3
Adjusting the Side-to-Side Level (Fixed Deck) . . . . . 7 - 4
Matching Height-of-Cut (Fixed Deck) . . . . . 7 - 4
Replacing the Mower Belt (Floating Deck) 36 in. (91cm) . . . . . 7 - 5
Replacing the PTO Drive Belt (Floating Deck) 36 in. (91cm) . . . . . 7 - 5
Replacing the Deck Belt (Floating Deck) 44 & 52 in. (111 & 132cm) . . . . . 7 - 6
Replacing the PTO Drive Belt (Floating Deck) 44 & 52 in. (111 & 132cm) . . . . . 7 - 6
Mower Deck Belt Replacement (Fixed Deck Models) . . . . . 7 - 7
Mower Deck Belt Guide Adjustment (Fixed Deck Models) . . . . . 7 - 8
Replacing the Mower Belt (Fixed Deck Gear Drive) 36 in. (91cm) . . . . . 7 - 8
Replacing the Mower Belt (Fixed Deck) 32 in. (81cm) . . . . . 7 - 9
Replacing the Mower Belt (Fixed Deck Gear Drive) 48 in. (122cm) . . . . . 7 - 10
Mower Deck Drive Belt Adjustment (Fixed Deck Models) . . . . . 7 - 12
Blade Engagement Adjustment (Fixed Deck) . . . . . 7 - 13
Blade Safety Switch Adjustment (Fixed Deck) . . . . . 7 - 14
Adjusting the Blade Brake (Fixed Deck) . . . . . 7 - 14
Replacing the Mower Belt (Fixed Deck Hydro, Pistol Grips) . . . . . 7 - 15
Adjusting Mower Belt Tension (Fixed Deck) - All . . . . . 7 - 16
Servicing the Cutting Blades (All Models) . . . . . 7 - 17
Correcting Uneven Cutting (Fixed Deck) . . . . . 7 - 19
Replace Spindle Bearings (Fixed Deck) . . . . . 7 - 20
Replace Spindle Bearings (Floating Deck) . . . . . 7 - 21
Replacing the Castor Wheel Fork Bushings (All Models) . . . . . 7 - 26
Castor Wheel and Bearings Service (Floating Deck) . . . . . 7 - 26
Replacing the Grass Deflector (All Models) . . . . . 7 - 27
Mower Deck Removal (Fixed Deck Models) . . . . . 7 - 28
Mower Deck Removal (Floating Deck) . . . . . 7 - 29

Electrical

Electrical Systems . . . . . 8 - 2
Tools . . . . . 8 - 2
Caution . . . . . 8 - 2
Servicing the Fuse (T-Bar and Pistol Grip Models) . . . . . 8 - 2
Relay . . . . . 8 - 2
Solenoid . . . . . 8 - 4
Ignition Switch . . . . . 8 - 5
Electric PTO Clutch . . . . . 8 - 6
Testing the Clutch Power Supply . . . . . 8 - 7
PTO Switch Test . . . . . 8 - 10
Transmission Switch (Gear Drive) . . . . . 8 - 10

TABLE OF CONTENTS

Electrical *(cont'd)*

Hourmeter . . . . . 8 - 11
Switch (65-7410 & 1-513051) . . . . . 8 - 11
Switch (95-1653) . . . . . 8 - 12
Bail Switch (82-2190) . . . . . 8 - 12
Rocker Switch (82-2300) . . . . . 8 - 12
Bridge Rectifier . . . . . 8 - 13
Delay Module (2000 and Earlier) . . . . . 8 - 14
Delay Module 104-8141 (T-Bar Floating Deck Electric Clutch 2001 & Up . . . . . 8 - 14
Interlock Module . . . . . 8 - 15

Wiring Diagrams

T-Bar (Fixed Deck - Gear) . . . . . 8 - 16
T-Bar (Fixed Deck - Gear) . . . . . 8 - 17
T-Bar (Fixed Deck - Gear) . . . . . 8 - 18
T-Bar (Fixed Deck - Gear) . . . . . 8 - 19
T-Bar (Floating Deck - Gear) . . . . . 8 - 20
T-Bar (Floating Deck - Gear) . . . . . 8 - 21
T-Bar (Floating Deck - Gear) . . . . . 8 - 22
T-Bar (Floating Deck - Gear) . . . . . 8 - 22
T-Bar (Floating Deck - Gear) . . . . . 8 - 23
T-Bar (Floating Deck - Gear and 1988 / 1999 Hydro) . . . . . 8 - 24
T-Bar (Floating Deck - Hydro) . . . . . 8 - 26
T-Bar (Floating Deck - Hydro) . . . . . 8 - 27
T Bar (Floating Deck - Hydro) . . . . . 8 - 28
T-Bar (Floating Deck - Hydro) . . . . . 8 - 29
T-Bar (Floating Deck - Hydro) . . . . . 8 - 30
Pistol Grip (Fixed Deck - Gear) . . . . . 8 - 31
Pistol Grip (Fixed Deck - Gear) . . . . . 8 - 32
Pistol Grip (Fixed Deck - Gear) . . . . . 8 - 33
Pistol Grip (Fixed Deck - Hydro) . . . . . 8 - 34
Pistol Grip (Fixed Deck - Hydro) . . . . . 8 - 35
Pistol Grip (Floating Deck - Gear) . . . . . 8 - 36
Pistol Grip (Floating Deck - Gear) . . . . . 8 - 37
Pistol Grip (Floating Deck - Hydro) . . . . . 8 - 38
Pistol Grip (Floating Deck - Hydro) . . . . . 8 - 39
Pistol Grip (Floating Deck - Hydro) . . . . . 8 - 40
Pistol Grip (Floating Deck - Hydro) . . . . . 8 - 41
Pistol Grip (Floating Deck - Hydro) . . . . . 8 - 42
Pistol Grip (Floating Deck - Hydro) . . . . . 8 - 43
Pistol Grip (Floating Deck - Hydro) . . . . . 8 - 44
Pistol Grip (Floating Deck - Hydro) . . . . . 8 - 45

General Information

This symbol means WARNING or PERSONAL SAFETY INSTRUCTION - read the instruction because it has to do with your safety. Failure to comply with the instruction may result in personal injury or even death.

This manual is intended as a service and repair manual only. The safety instructions provided herein are for troubleshooting, service, and repair of the Mid-Size Walk Behind mower. The Mid-Size Walk Behind

Mower and attachment operator's manuals contain safety information and operating tips for safe operating practices. Operator's manuals are available through your Toro parts source or:

The Toro Company
Publications Department
8111 Lyndale Avenue South
Bloomington, MN 55420

Think Safety First

Avoid unexpected starting of engine...

Always turn off the engine and disconnect the spark plug wire(s) before cleaning, adjusting, or repair.

Avoid lacerations and amputations...

Stay clear of all moving parts whenever the engine is running. Treat all normally moving parts as if they were moving whenever the engine is running or has the potential to start.

Avoid burns...

Do not touch the engine, muffler, or other components which may increase in temperature during operation, while the unit is running or shortly after it has been running.

Avoid fires and explosions...

Avoid spilling fuel and never smoke while working with any type of fuel or lubricant. Wipe up any spilled fuel or oil immediately. Never remove the fuel cap or add fuel when the engine is running. Always use approved, labeled containers for storing or transporting fuel and lubricants.

Avoid asphyxiation...

Never operate an engine in a confined area without proper ventilation.

Avoid injury from batteries...

Battery acid is poisonous and can cause burns. Avoid contact with skin, eyes, and clothing. Battery gases can explode. Keep cigarettes, sparks, and flames away from the battery.

Avoid injury due to inferior parts...

Use only original equipment parts to ensure that important safety criteria are met.

Avoid injury to bystanders...

Always clear the area of bystanders before starting or testing powered equipment.

Avoid injury due to projectiles...

Always clear the area of sticks, rocks, or any other debris that could be picked up and thrown by the powered equipment.

Avoid modifications...

Never alter or modify any part unless it is a factory approved procedure.

Avoid unsafe operation...

Always test the safety interlock system after making adjustments or repairs on the machine. Refer to the Electrical section in this manual for more information.

THIS PAGE INTENTIONALLY LEFT BLANK

Torque Specifications

Recommended fastener torque values are listed in the following tables. For critical applications, as determined by Toro, either the recommended torque or a torque that is unique to the application is clearly identified and specified in the service manual.

These torque specifications for the installation and tightening of fasteners shall apply to all fasteners which do not have a specific requirement identified in the service manual. The following factors shall be considered when applying torque: cleanliness of the fastener, use of a thread sealant (Loctite), degree of lubrication on the fastener, presence of a prevailing torque feature, hardness of the surface underneath of the fastener's head, or similar condition which affects the installation.

As noted in the following tables, torque values should be **reduced by 25% for lubricated fasteners** to achieve the similar stress as a dry fastener. Torque values may also have to be reduced when the fastener is threaded into aluminum or brass. The specific torque value should be determined based on the aluminum or brass material strength, fastener size, length of thread engagement, etc.

The standard method of verifying torque shall be performed by marking a line on the fastener (head or nut) and mating part, then back off fastener 1/4 of a turn. Measure the torque required to tighten the fastener until the lines match up.

Fastener Identification

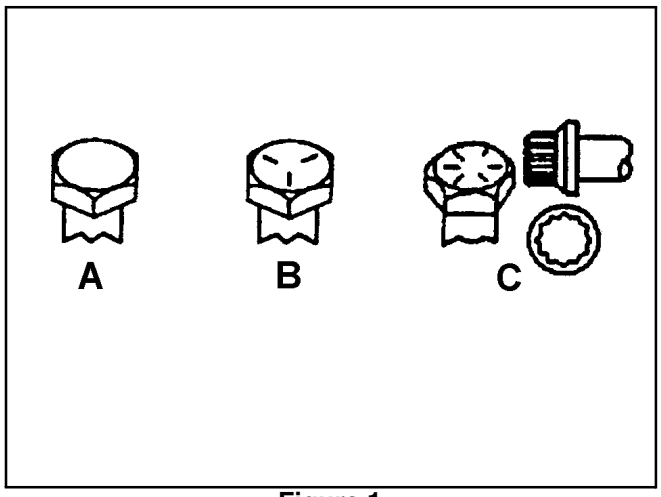


Figure 1

Inch Series Bolts and Screws	
(A) Grade 1 & 2 (B) Grade 5	(C) Grade 8

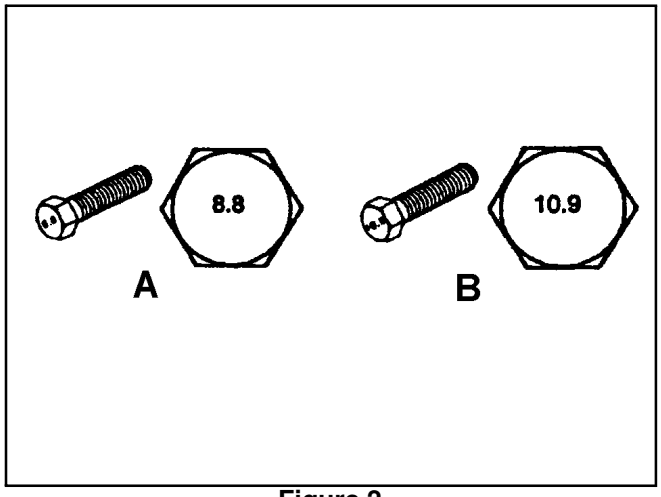


Figure 2

Metric Bolts and Screws	
(A) Class 8.8	(B) Class 10.9

SPECIFICATIONS

Standard Torque for Dry, Zinc Plated, and Steel Fasteners (Inch Series)

Thread Size	Grade 1, 5, & 8 with Thin Height Nuts	SAE Grade 1 Bolts, Screws, Studs, & Sems with Regular Height Nuts (SAE J995 Grade 2 or Stronger Nuts)		SAE Grade 5 Bolts, Screws, Studs, & Sems with Regular Height Nuts (SAE J995 Grade 2 or Stronger Nuts)		SAE Grade 8 Bolts, Screws, Studs, & Sems with Regular Height Nuts (SAE J995 Grade 2 or Stronger Nuts)	
	In-lb	In-lb	N-cm	In-lb	N-cm	In-lb	N-cm
# 6 - 32 UNC	10 ± 2	13 ± 2	147 ± 23	15 ± 2	169 ± 23	23 ± 2	260 ± 34
# 6 - 40 UNF				17 ± 2	190 ± 20	25 ± 2	280 ± 20
# 8 - 32 UNC	13 ± 2	25 ± 5	282 ± 30	29 ± 3	330 ± 30	41 ± 4	460 ± 45
# 8 - 36 UNF				31 ± 3	350 ± 30	43 ± 4	31 ± 3
# 10 - 24 UNC	18 ± 2	30 ± 5	339 ± 56	42 ± 4	475 ± 45	60 ± 6	674 ± 70
#10 - 32 UNF				48 ± 4	540 ± 45	68 ± 6	765 ± 70
1/4 - 20 UNC	48 ± 7	53 ± 7	599 ± 79	100 ± 10	1125 ± 100	140 ± 15	1580 ± 170
1/4 - 28 UNF	53 ± 7	65 ± 10	734 ± 113	115 ± 10	1300 ± 100	160 ± 15	1800 ± 170
5/16 - 18 UNC	115 ± 15	105 ± 15	1186 ± 169	200 ± 25	2250 ± 280	300 ± 30	3390 ± 340
5/16 - 24 UNF	138 ± 17	128 ± 17	1446 ± 192	225 ± 25	2540 ± 280	325 ± 30	3670 ± 340
	ft-lb	ft-lb	N-m	ft-lb	N-m	ft-lb	N-m
3/8 - 16 UNC	16 ± 2	16 ± 2	22 ± 3	30 ± 3	41 ± 4	43 ± 4	58 ± 5
3/8 - 24 UNF	17 ± 2	18 ± 2	24 ± 3	35 ± 3	47 ± 4	50 ± 4	68 ± 5
7/16 - 14 UNC	27 ± 3	27 ± 3	37 ± 4	50 ± 5	68 ± 7	70 ± 7	68 ± 9
7/16 - 20 UNF	29 ± 3	29 ± 3	39 ± 4	55 ± 5	75 ± 7	77 ± 7	104 ± 9
1/2 - 13 UNC	30 ± 3	48 ± 7	65 ± 9	75 ± 8	102 ± 11	105 ± 10	142 ± 14
1/2 - 20 UNF	32 ± 3	53 ± 7	72 ± 9	85 ± 8	115 ± 11	120 ± 10	163 ± 14
5/8 - 11 UNC	65 ± 10	88 ± 12	119 ± 16	150 ± 15	203 ± 20	210 ± 20	285 ± 27
5/8 - 18 UNF	75 ± 10	95 ± 15	129 ± 20	170 ± 15	230 ± 20	240 ± 20	325 ± 27
3/4 - 10 UNC	93 ± 12	140 ± 20	190 ± 27	265 ± 25	359 ± 34	374 ± 35	508 ± 47
3/4 - 16 UNF	115 ± 15	165 ± 25	224 ± 34	300 ± 25	407 ± 34	420 ± 35	569 ± 47
7/8 - 9 UNC	140 ± 20	225 ± 25	305 ± 34	430 ± 45	583 ± 61	600 ± 60	813 ± 81
7/8 - 14 UNF	155 ± 25	260 ± 30	353 ± 41	475 ± 45	644 ± 61	660 ± 60	895 ± 81

Note: Reduce torque values listed in the table above by 25% for lubricated fasteners. Lubricated fasteners are defined as threads coated with a lubricant such as oil, graphite, or thread sealant such as Loctite.

Note: Torque values may have to be reduced when installing fasteners into threaded aluminum or brass. The specific torque value should be determined based on the fastener size, the aluminum or base material strength, length of thread engagement, etc.

Note: The nominal torque values listed above for Grade 5 and 8 fasteners are based on 75% of the minimum proof load specified in SAE J429. The tolerance is approximately ± 10% of the nominal torque value. Thin height nuts include jam nuts.

Standard Torque for Dry, Zinc, and Steel Fasteners (Metric Fasteners)

Thread Size	Class 8.8 Bolts, Screws, and Studs with Regular Height Nuts (Class 8 or Strong Nuts)		Class 10.9 Bolts, Screws, and Studs with Regular Height Nuts (Class 10 or Strong Nuts)	
M5 X 0.8	57 ± 5 in-lb	644 ± 68 N-cm	78 ± 8 in-lb	881 ± 90 N-cm
M6 X 1.0	96 ± 10 in-lb	1085 ± 113 N-cm	133 ± 14 in-lb	1503 ± 158 N-cm
M8 X 1.25	19 ± 2 ft-lb	26 ± 3 N-m	28 ± 3 ft-lb	38 ± 4 N-m
M10 X 1.5	38 ± 4 ft-lb	52 ± 5 N-m	54 ± 6 ft-lb	73 ± 8 N-m
M12 X 1.75	66 ± 7 ft-lb	90 ± 10 N-m	93 ± 10 ft-lb	126 ± 14 N-m
M16 X 2.0	166 ± 15 ft-lb	225 ± 23 N-m	229 ± 23 ft-lb	310 ± 31 N-m
M20 X 2.5	325 ± 33 ft-lb	440 ± 45 N-m	450 ± 36 ft-lb	610 ± 62 N-m

Note: Reduce torque values listed in the table above by 25% for lubricated fasteners. Lubricated fasteners are defined as threads coated with a lubricant such as oil, graphite, or thread sealant such as Loctite.

Note: Torque values may have to be reduced when installing fasteners into threaded aluminum or brass. The specific torque value should be determined based on the fastener size, the aluminum or base material strength, length of thread engagement, etc.

Note: The nominal torque values listed above are based on 75% of the minimum proof load specified in SAE J1199. The tolerance is approximately ± 10% of the nominal torque value. Thin height nuts include jam nuts.

Other Torque Specifications

SAE Grade 8 Steel Set Screws

Thread Size	Recommended Torque	
	Square Head	Hex Socket
1/4 - 20 UNC	140 ± 20 in-lb	73 ± 12 in-lb
5/16 - 18 UNC	215 ± 35 in-lb	145 ± 20 in-lb
3/8 - 16 UNC	35 ± 10 ft-lb	18 ± 3 ft-lb
1/2 - 13 UNC	75 ± 15 ft-lb	50 ± 10 ft-lb

Wheel Bolts and Lug Nuts

Thread Size	Recommended Torque**	
7/16 - 20 UNF Grade 5	65 ± 10 ft-lb	88 ± 14 N-m
1/2 - 20 UNF Grade 5	80 ± 10 ft-lb	108 ± 14 N-m
M12 X 1.25 Class 8.8	80 ± 10 ft-lb	108 ± 14 N-m
M12 X 1.5 Class 8.8	80 ± 10 ft-lb	108 ± 14 N-m

** For steel wheels and non-lubricated fasteners.

Thread Cutting Screws (Zinc Plated Steel)

Type 1, Type 23, or Type F	
Thread Size	**Baseline Torque***
No. 6 - 32 UNC	20 ± 5 in-lb
No. 8 - 32 UNC	30 ± 5 in-lb
No.10 - 24 UNC	38 ± 7 in-lb
1/4 - 20 UNC	85 ± 15 in-lb
5/16 - 18 UNC	110 ± 20 in-lb
3/8 - 16 UNC	200 ± 100 in-lb

Thread Cutting Screws (Zinc Plated Steel)

Thread Size	Threads per Inch		Baseline Torque*
	Type A	Type B	
No. 6	18	20	20 ± 5 in-lb
No. 8	15	18	30 ± 5 in-lb
No. 10	12	16	38 ± 7 in-lb
No. 12	11	14	85 ± 15 in-lb

* Hole size, material strength, material thickness and finish must be considered when determining specific torque values. All torque values are based on non-lubricated fasteners.

Conversion Factors

in-lb X 11.2985 = N-cm
ft-lb X 1.3558 = N-m

N-cm X - 0.08851 = in-lb
N-cm X 0.73776 = ft-lb

Equivalents and Conversions

Decimal and Millimeter Equivalents

Fractions	Decimals	mm	Fractions	Decimals	mm
1/64	0.015625	0.397	33/64	0.515625	13.097
1/32	0.03125	0.794	16/32	0.53125	13.484
3/64	0.046875	1.191	35/64	0.546875	13.891
1/16	0.0625	1.588	9/16	0.5625	14.288
5/64	0.078125	1.984	37/64	0.578125	14.684
3/32	0.9375	2.381	19/32	0.59375	15.081
1/8	0.1250	3.175	5/8	0.6250	15.875
9/64	0.140625	3.572	41/64	0.640625	16.272
5/32	0.15625	3.969	21/32	0.65625	16.669
11/64	0.171875	4.366	43/64	0.671875	17.066
3/16	0.1875	4.762	11/16	0.6875	17.462
13/64	0.203125	5.159	45/64	0.703125	17.859
7/32	0.21875	5.556	23/32	0.71875	18.256
15/64	0.234375	5.953	47/64	0.734375	18.653
1/4	0.2500	6.350	3/4	0.7500	19.050
17/64	0.265625	6.747	49/64	0.765625	19.447
9/32	0.28125	7.144	25/32	0.78125	19.844
19/64	0.296875	7.541	51/64	0.796875	20.241
5/16	0.3125	7.541	13/16	0.8125	20.638
21/64	0.328125	8.334	53/64	0.828125	21.034
11/32	0.34375	8.731	27/32	0.84375	21.431
23/64	0.359375	9.128	55/64	0.859375	21.828
3/8	0.3750	9.525	7/8	0.8750	22.225
25/64	0.390625	9.922	57/64	0.890625	22.622
13/32	0.40625	10.319	29/32	0.90625	23.019
27/64	0.421875	10.716	59/64	0.921875	23.416
7/16	0.4375	11.112	15/16	0.9375	23.812
29/64	0.453125	11.509	61/64	0.953125	24.209
15/32	0.46875	11.906	31/32	0.96875	24.606
31/64	0.484375	12.303	63/64	0.984375	25.003
1/2	0.5000	12.700	1	1.000	25.400
1 mm = 0.03937 in.			0.001 in. = 0.0254 mm		

U.S. to Metric Conversions

	To Convert	Into	Multiply By
Linear Measurement	Miles	Kilometers	1.609
	Yards	Meters	0.9144
	Feet	Meters	0.3048
	Feet	Centimeters	30.48
	Inches	Meters	0.0254
	Inches	Centimeters	2.54
	Inches	Millimeters	25.4
Area	Square Miles	Square Kilometers	2.59
	Square Feet	Square Meters	0.0929
	Square Inches	Square Centimeters	6.452
	Acre	Hectare	0.4047
Volume	Cubic Yards	Cubic Meters	0.7646
	Cubic Feet	Cubic Meters	0.02832
	Cubic Inches	Cubic Centimeters	16.39
Weight	Tons (Short)	Metric Tons	0.9078
	Pounds	Kilograms	0.4536
	Ounces	Grams	28.3495
Pressure	Pounds/Sq. In.	Kilopascal	6.895
Work	Foot-pounds	Newton-Meters	1.356
	Foot-pounds	Kilogram-Meters	0.1383
	Inch-pounds	Kilogram-Centimeters	1.152144
Liquid Volume	Quarts	Liters	0.9463
	Gallons	Liters	3.785
Liquid Flows	Gallons/Minute	Liters/Minute	3.785
Temperature	Fahrenheit	Celsius	1. Subtract 32° 2. Multiply by 5/9

Product Specifications

Model	Engine Make	Horse Power	Oil Capacity w/ Filter Change	RPM High Speed	RPM Low Speed	Deck	Fixed Deck	Floating Deck	Traction Unit	Gear Drive	Hydro Drive	Chassis	PG	T-Bar
30140	Kawasaki	15	58 oz. (1.7 l)	3600+-100	1550	48” SD	X			X				X
30150	Kawasaki	13	58 oz. (1.7 l)	3600+-100	1550	32" SD	X			X				X
30159	Kohler	15	64 oz. (1.9 l)	3200+-100	1400+-200				X	X				X
30161	Kawasaki	13	58 oz. (1.7 l)	3600+-100	1550	36" SD	X			X				X
30164	Briggs & Stratton	10.5	48 oz. (1.4 l)	3600+-100	---	32" SD	X			X				X
30167	Kawasaki	12.5	48 oz. (1.4 l)	3,350	1400				X	X				X
30168	Kawasaki	15	58 oz. (1.7 l)	3200+-100	1400				X	X				X
30169	Kawasaki	17	58 oz. (1.7 l)	3200+-100	1400				X	X				X
30171	Kawasaki	12.5	48 oz. (1.4 l)	3600+-100	1400	32" SD	X			X				X
30177	Kohler	15	64 oz. (1.9 l)	3600+-100	900 to 1,000				X	X				X
30178	Kohler	15	64 oz. (1.9 l)	3600+-50	1400+-200	36" SD	X			X				X
30182	Briggs & Stratton	16	56 oz. (1.7 l)	3200+-100	1400+-200				X	X				X
30183	Kohler	18	64 oz. (1.9 l)	3250+-75	1400+-75				X	X				X
30184	Kohler	13	64 oz. (1.9 l)	3600+-50	1500	91cm SD	X			X				X
30187	Kohler	15	64 oz. (1.9 l)	3200+-100	1400+-200				X		X			X
30188	Briggs & Stratton	16	56 oz. (1.7 l)	3200+-100	1400+-200				X		X			X
30189	Briggs & Stratton	16	56 oz. (1.7 l)	3200+-100	1400+-200				X		X			X
30192	Kohler	20	64 oz. (1.9 l)	3200+-100	1400+-200				X		X			X
30193	Kawasaki	12.5	48 oz. (1.4 l)	3600+-100	1400	36" SD	X			X				X
30194	Kohler	13	64 oz. (1.9 l)	3600+-50	1400+-200	36" SD	X			X				X
30195	Kawasaki	15	58 oz. (1.7 l)	3600+-100	1550	48" SD	X			X				X
30196	Kawasaki	14	54 oz. (1.6 l)	3600+-100	1550	48" SD	X			X				X
30197	Kohler	15	64 oz. (1.9 l)	3600+-50	1400+-200	48" SD	X			X				X
30250	Kawasaki	12.5	48 oz. (1.4 l)	3600+-100	1400	36" SD		X		X				X
30252	Kohler	13	64 oz. (1.9 l)	3200+-100	1400+-200	32" SD		X		X				X
30253	Kohler	15	64 oz. (1.9 l)	3600+-50	1550	36" SD		X		X				X
30254	Kohler	15	64 oz. (1.9 l)	3600+-50	1400+-200	44" SD		X		X				X
30255	Kohler	15	64 oz. (1.9 l)	3600+-50	1400+-200	52" SD		X		X				X
30257	Kawasaki	15	58 oz. (1.7 l)	3600+-100	1550	44" SD		X		X				X
30258	Kawasaki	15	58 oz. (1.7 l)	3600+-100	1550	52" SD		X		X				X
30259	Kawasaki	17	58 oz. (1.7 l)	3600+-100	1550	44" SD		X		X				X
30260	Kawasaki	17	58 oz. (1.7 l)	3600+-100	1550	52" SD		X		X				X
30290	Kohler	15	64 oz. (1.9 l)	3600+-50	1400+-200	36" SD		X			X			X
30291	Kohler	15	64 oz. (1.9 l)	3600+-50	1400+-200	44" SD		X			X			X
30292	Kohler	15	64 oz. (1.9 l)	3600+-50	1400+-200	52" SD		X			X			X

Model	Engine Make	Horse Power	Oil Capacity w/ Filter Change	RPM High Speed	RPM Low Speed	Deck	Fixed Deck	Floating Deck	Traction Unit	Gear Drive	Hydro Drive	Chassis	PG	T-Bar
30297	Kawasaki	17	58 oz. (1.7 l)	3600+-100	1550	52" SD		X			X			X
30314	Kawasaki	13	60 oz. (1.8 l)	3600+-100	1550	91cm SD		X		X				X
30316	Kohler	13	64 oz. (1.9 l)	3200+-100	1400+-200	32" SD		X		X				X
30317	Kohler	15	64 oz. (1.9 l)	3600+-50	1400+-200	36" SD		X		X				X
30318	Kohler	15	64 oz. (1.9 l)	3600+-50	1400+-200	44" SD		X		X				X
30319	Kohler	15	64 oz. (1.9 l)	3600+-50	1400+-200	52" SD		X		X				X
30320	Kawasaki	15	58 oz. (1.7 l)	3600+-100	1550	44" SD		X		X				X
30321	Kawasaki	17	58 oz. (1.7 l)	3600+-100	1550	44" SD		X		X				X
30322	Kawasaki	17	58 oz. (1.7 l)	3600+-100	1550	52" SD		X		X				X
30326	Kawasaki	15	58 oz. (1.7 l)	3600+-100	1550	44" SD		X		X				X
30327	Kawasaki	17	58 oz. (1.7 l)	3600+-100	1550	44" SD		X		X				X
30329	Kohler	15	64 oz. (1.9 l)	3600+-50	1400+-200	36" SD		X		X			X	
30332	Kawasaki	15	58 oz. (1.7 l)	3600+-100	1550	44" SD		X		X			X	
30333	Kawasaki	15	58 oz. (1.7 l)	3600+-100	1550	52" SD		X		X			X	
30334	Kawasaki	17	58 oz. (1.7 l)	3600+-100	1550	52" SD		X		X			X	
30335	Kohler	15	64 oz. (1.9 l)	3600+-50	1400+-200	36" SD		X			X		X	
30338	Kawasaki	15	64 oz. (1.9 l)	3600+-100		44" SD		X			X		X	
30339	Kawasaki	15	64 oz. (1.9 l)	3600+-100	1550	52" SD		X			X		X	
30340	Kawasaki	17	58 oz. (1.7 l)	3600+-100	1550	44" SD		X			X		X	
30341	Kawasaki	17	58 oz. (1.7 l)	3600+-100	1550	52" SD		X			X		X	
30342	Kawasaki	17	58 oz. (1.7 l)	3600+-100	1550	52" SD		X		X				X
30430	Kohler	15	64 oz. (1.9 l)	3600+-50	1400+-200	36" SD		X		X			X	
30431	Kawasaki	15	58 oz. (1.7 l)	3600+-100	1550	44" SD		X		X			X	
30432	Kawasaki	17	58 oz. (1.7 l)	3600+-100	1550	52" SD		X		X			X	
30433	Kohler	15	64 oz. (1.9 l)	3600+-50	1400+-200	36" SD		X			X		X	
30434	Kawasaki	15	58 oz. (1.7 l)	3600+-100	1550	44" SD		X			X		X	
30435	Kawasaki	17	58 oz. (1.7 l)	3600+-100	1550	44" SD		X			X		X	
30436	Kawasaki	17	58 oz. (1.7 l)	3600+-100	1550	52" SD		X			X		X	
30437	Kawasaki	15	58 oz. (1.7 l)	3600+-100	1550	44" SD		X		X			X	
30438	Kawasaki	17	58 oz. (1.7 l)	3600+-100	1550	52" SD		X		X			X	
30439	Kawasaki	15	58 oz. (1.7 l)	3600+-100	1550	44" SD		X			X		X	
30440	Kawasaki	17	58 oz. (1.7 l)	3600+-100	1550	44" SD		X			X		X	
30441	Kawasaki	17	58 oz. (1.7 l)	3600+-100	1550	52" SD		X			X		X	
30518	Kawasaki	13	58 oz. (1.7 l)	3600+-100	1550	32" SD	X			X			X	
30519	Kawasaki	13	58 oz. (1.7 l)	3600+-100	1550	36" SD	X			X			X	
30520	Kawasaki	12.5	48 oz. (1.4 l)	3600+-50	1400	32" SD	X			X			X	

Model	Engine Make	Horse Power	Oil Capacity w/ Filter Change	RPM High Speed	RPM Low Speed	Deck	Fixed Deck	Floating Deck	Traction Unit	Gear Drive	Hydro Drive	Chassis	PG	T-Bar
30521	Kawasaki	12.5	48 oz. (1.4 l)	3600+-50	1400	36" SD	X			X			X	
30523	Kawasaki	15	58 oz. (1.7 l)	3600+-100	1550	48" SD	X			X			X	
30524	Kawasaki	15	58 oz. (1.7 l)	3600+-100	1550	36" SD	X				X		X	
30526	Kawasaki	15	58 oz. (1.7 l)	3600+-100	1550	48" SD	X				X		X	
30527	Kohler	15	64 oz. (1.9 l)	3600+-50	1400+-200	36" SD	X				X		X	
30528	Kohler	15	64 oz. (1.9 l)	3600+-100	1400+-200	48" SD	X				X		X	
30529	Kohler	15	64 oz. (1.9 l)	3600+-50	1400+-200	36" SD	X			X			X	
30530	Kohler	15	64 oz. (1.9 l)	3600+-50	1400+-200	48" SD	X			X			X	
30531	Kawasaki	15	58 oz. (1.7 l)	3600+-100	1550	48" SD	X			X			X	
30172TE	Kawasaki	12.5	54 oz. (1.6 l)	2800	1400				X	X				X
30250TE	Kawasaki	12.5	54 oz. (1.6 l)	2800	1400	36" SD		X		X				X
30261TE	Kawasaki	12.5	54 oz. (1.6 l)	2760	1400	91cm SD		X		X				X
30291TE	Kohler	15	64 oz. (1.9 l)	2800	1400+-200	44" SD		X			X			X
30299TE	Kawasaki	15	58 oz. (1.7 l)	2800+-100	1400+-200	112cm SD		X			X			X

Product Dimensions

Model	Years	Width	Height	Length	Weight (lbs.)	Tire Dimensions		Tire Pressure	
						Front	Rear	Front	Rear
30140	2004	35.0"	41"	72"	435	9" X 3.5"	13x6.50"-6	25-30 PSI (172-207kPa)	15 PSI (103 kPa)
30150	2004	32.0"	40"	74"	374	9" X 3.5"	13x6.50"-6	25-30 PSI (172-207 kPa)	15 PSI (103 kPa)
30159	1997-2000	30.0"	43.5"	40.0"	258	NA	15x6.00" - 6	NA	15 PSI (103 kPa)
30161	2004	35.0"	41"	74"	392	9" X 3.5"	13x6.50"-6	25-30 PSI (172-207 kPa)	15 PSI (103 kPa)
30164	2000-2002	42"	41"	78"	374	9"x3.5-4"	13x6.50"-6	25-30 PSI (172-207 kPa)	15 PSI (103 kPa)
30167	1996-2002	35.0"	44.5"	45.0"	260	NA	15x6.00" - 6	NA	15 PSI (103 kPa)
30168	2000	35.0"	44.5"	40.0"	270	NA	15x6.00" - 6	NA	15 PSI (103 kPa)
30169	2000, 2002 & 2004	35.0"	44.5"	40.0"	270	NA	15x6.00" - 6	NA	15 PSI (103 kPa)
30171	2000-2003	42"	41"	78"	374	9"x3.5-4"	13x6.50"-6	25-30 PSI (172-207 kPa)	15 PSI (103 kPa)
30177	1996-2002 & 2004	35.0"	44.5"	40.0"	261	NA	15x6.00" - 6	NA	15 PSI (103kPa)
30178	2003-2004	35.0"	41"	74"	392	NA	13x6.50"-6	25-30 PSI (172-207 kPa)	15 PSI (103 kPa)
30182	1996-1999	35.0"	44.5"	40.0"	270	NA	15x6.00" - 6	NA	15 PSI (103 kPa)
30183	1996-1999	35.0"	44.5"	45.0"	294	NA	15x6.00" - 6	15 PSI (103 kPa)	15 PSI (103 kPa)
30184	1998-2000	35.0"	41.0"	74.0"	392	9"x3.5-4"	9x3.50" - 4	25-30 PSI (172-207 kPa)	15 PSI (103 kPa)
30187	1997-2000 & 02 & 04	33.0”	44.5”	43.0”	340	NA	15x6.00" - 6	NA	15 PSI (103 kPa)
30188	1997 & 2000	33.0”	44.5”	43.0”	340	NA	13x6.50"-6	NA	15 PSI (103 kPa)
30189	1997-1998	33.0”	44.5”	43.0”	340	NA	15x6.00" - 6	NA	15 PSI (103 kPa)
30192	1997-1998 & 02	33.0"	44.5"	43.0"	375	NA	13x6.50"-6	NA	15 PSI (103 kPa)
30193	1997-2000	46"	41"	74"	392	9"x3.5-4"	13x6.50"-6	25-30 PSI (172-207 kPa)	15 PSI (103 kPa)
30194	1998-2002	46"	41"	74"	392	9"x3.5-4"	13x6.50"-6	25-30 PSI (172-207 kPa)	15 PSI (103 kPa)
30195	2003	35.0"	41"	72"	435	9"x3.5-4"	6.5" X 13"	25-30 PSI (172-207 kPa)	15 PSI (103 kPa)

Model	Years	Width	Height	Length	Weight (lbs.)	Tire Dimensions		Tire Pressure	
						Front	Rear	Front	Rear
30196	1998-2002	64"	41"	72"	429	9"x3.5-4"	13x6.50"-6	25-30 PSI (172-207 kPa)	15 PSI (103 kPa)
30197	1998-2004	64"	41"	72"	429	9"x3.5-4"	13x6.50"-6	25-30 PSI (172-207 kPa)	15 PSI (103 kPa)
30250	2001	48"	44"	83.5"	416	11"x4.00-5"	16x6.50" – 8 (40.6x16.5 – 20.3 mm)	20-24 PSI (138-165 kPa)	12-14 PSI (83-97 kPa)
30252	2001-2002	32"	42"	76.5"	388	6.25"x3"	14x5.00"-6	15 PSI (103kPa)	15 PSI (103 kPa)
30253	2001	48"	44"	83.5"	417	11"x4.00-5"	16x6.50" – 8 (40.6x16.5 – 20.3 mm)	20-24 PSI (138-165 kPa)	12-14 PSI (83-97 kPa)
30254	2001	56"	44"	80"	448	11"x4.00-5"	16x6.50" – 8 (40.6x16.5 – 20.3 mm)	20-24 PSI (138-165 kPa)	12-14 PSI (83-97 kPa)
30255	2001	64"	44"	80"	451	11"x4.00-5"	16x6.50" – 8 (40.6x16.5 – 20.3 mm)	20-24 PSI (138-165 kPa)	12-14 PSI (83-97 kPa)
30257	2001	56"	44"	80"	458	11"x4.00-5"	16x6.50" – 8 (40.6x16.5 – 20.3 mm)	20-24 PSI (138-165 kPa)	12-14 PSI (83-97 kPa)
30258	2001	66.5"	47.0"	82.3"	528	11"x4.00-5"	16X7.50"-8	20-24 PSI (138-165 kPa)	12-14 PSI (83-97 kPa)
30259	2001	56"	44"	80"	460	11"x4.00-5"	16x6.50" – 8 (40.6x16.5 – 20.3 mm)	20-24 PSI (138-165 kPa)	12-14 PSI (83-97 kPa)
30260	2001	64"	44"	80"	463	11"x4.00-5"	16x6.50" – 8 (40.6x16.5 – 20.3 mm)	20-24 PSI (138-165 kPa)	12-14 PSI (83-97 kPa)
30290	2001	48"	44"	83.5"	496	11"x4.00-5"	16x6.50" – 8 (40.6x16.5 – 20.3 mm)	20-24 PSI (138-165 kPa)	12-14 PSI (83-97 kPa)
30291	2001	56"	44"	80"	527	11"x4.00-5"	16x6.50" – 8 (40.6x16.5 – 20.3 mm)	20-24 PSI (138-165 kPa)	12-14 PSI (83-97 kPa)
30292	2001	64"	44"	80"	530	11"x4.00-5"	16x6.50" – 8 (40.6x16.5 – 20.3 mm)	20-24 PSI (138-165 kPa)	12-14 PSI (83-97 kPa)
30314	2004	48.3" (122.7 cm)	45.5" (115.6 cm)	80.5" (264.5 cm)	465 lbs. (211 Kg)	9 X 3.5 - 4" (23 X 9 – 10 cm)	16x6.50" – 8 (40.6x16.5 – 20.3 mm)	25-30 PSI (172-207 kPa)	15 PSI (103 kPa)
30316	2003-2004	32.0"	43.5"	73.0"	388	6.25"x3"	14X5.00--6	NA	15 PSI
30317	2003-2004	48.3"	45.5"	80.5"	477	9 X 3.5 - 4" (23 X 9 – 10 cm)	16x6.50" – 8 (40.6x16.5 – 20.3 mm)	25-30 PSI (172-207 kPa)	15 PSI (103 kPa)
30318	2003-2004	58.7"	45.5"	79.6"	511	9 X 3.5 - 4" (23 X 9 – 10 cm)	16x6.50" – 8 (40.6x16.5 – 20.3 mm)	25-30 PSI (172-207 kPa)	15 PSI (103 kPa)
30319	2003-2004	66.6"	45.5"	80.7"	585	9 X 3.5 - 4" (23 X 9 – 10 cm)	16x6.50" – 8 (40.6x16.5 – 20.3 mm)	25-30 PSI (172-207 kPa)	15 PSI (103 kPa)
30320	2003	58.7"	45.5"	79.6"	494	9 X 3.5 - 4" (23 X 9 – 10 cm)	16x6.50" – 8 (40.6x16.5 – 20.3 mm)	25-30 PSI (172-207 kPa)	15 PSI (103 kPa)

Model	Years	Width	Height	Length	Weight (lbs.)	Tire Dimensions		Tire Pressure	
						Front	Rear	Front	Rear
30321	2003-2004	58.7"	45.5"	79.6"	494	9 X 3.5 - 4" (23 X 9 – 10 cm)	16x6.50" – 8 (40.6x16.5 – 20.3 mm)	25-30 PSI (172-207 kPa)	15 PSI (103 kPa)
30322	2003-2004	66.6"	45.5"	80.7"	568	9 X 3.5 - 4" (23 X 9 – 10 cm)	16x6.50" – 8 (40.6x16.5 – 20.3 mm)	25-30 PSI (172-207 kPa)	15 PSI (103 kPa)
30326	2004	58.7"	45.5"	79.6"	494	9 X 3.5 - 4" (23 X 9 – 10 cm)	16x6.50" – 8 (40.6x16.5 – 20.3 mm)	25-30 PSI (172-207 kPa)	15 PSI (103 kPa)
30327	2004	58.7"	45.5"	79.6"	494	9 X 3.5 - 4" (23 X 9 – 10 cm)	16x6.50" – 8 (40.6x16.5 – 20.3 mm)	15 PSI (103 kPa)	15 PSI (103 kPa)
30329	2001	48"	44"	83.5"	417	11"x4.00-5"	16x6.50" – 8 (40.6x16.5 – 20.3 mm)	20-24 PSI (138-165 kPa)	12-14 PSI (83-97 kPa)
30332	2001	56"	44"	80"	458	11"x4.00-5"	16x6.50" – 8 (40.6x16.5 – 20.3 mm)	20-24 PSI (138-165 kPa)	12-14 PSI (83-97 kPa)
30333	2001	64"	44"	80"	461	11"x4.00-5"	16x6.50" – 8 (40.6x16.5 – 20.3 mm)	20-24 PSI (138-165 kPa)	12-14 PSI (83-97 kPa)
30334	2001	64"	44"	80"	463	11"x4.00-5"	16x6.50" – 8 (40.6x16.5 – 20.3 mm)	20-24 PSI (138-165 kPa)	12-14 PSI (83-97 kPa)
30335	2001	48"	44"	83.5"	496	11"x4.00-5"	16x6.50" – 8 (40.6x16.5 – 20.3 mm)	20-24 PSI (138-165 kPa)	12-14 PSI (83-97 kPa)
30338	2001	56"	44"	80"	527	11"x4.00-5"	16x6.50" – 8 (40.6x16.5 – 20.3 mm)	20-24 PSI (138-165 kPa)	12-14 PSI (83-97 kPa)
30339	2001	64"	44"	80"	530	11"x4.00-5"	16x6.50" – 8 (40.6x16.5 – 20.3 mm)	20-24 PSI (138-165 kPa)	12-14 PSI (83-97 kPa)
30340	2001	56"	44"	80"	550	11"x4.00-5"	16x6.50" – 8 (40.6x16.5 – 20.3 mm)	20-24 PSI (138-165 kPa)	12-14 PSI (83-97 kPa)
30341	2001	64"	44"	80"	560	11"x4.00-5"	16x6.50" – 8 (40.6x16.5 – 20.3 mm)	20-24 PSI (138-165 kPa)	12-14 PSI (83-97 kPa)
30342	2004	66.6	45.5	80.7"	568	9 X 3.5 - 4" (23 X 9 – 10 cm)	16x6.50" – 8 (40.6x16.5 – 20.3 mm)	20-24 PSI (138-165 kPa)	12-14 PSI (83-97 kPa)
30430	2003-2004	48.3	44.2	82.3	477 (216 KG)	9 X 3.5 - 4" (23 X 9 – 10 cm)	16x6.50" – 8 (40.6x16.5 – 20.3 mm)	20-24 PSI (138-165 kPa)	12-14 PSI (83-97 kPa)
30431	2003-2004	58.7"	44.2"	81.5"	496 (225 KG)	9 X 3.5 - 4" (23 X 9 – 10 cm)	16x6.50" – 8 (40.6x16.5 – 20.3 mm)	20-24 PSI (138-165 kPa)	12-14 PSI (83-97 kPa)
30432	2003-2004	66.6"	44.2"	82.3"	570 (258 KG)	9 X 3.5 - 4" (23 X 9 – 10 cm)	16x6.50" – 8 (40.6x16.5 – 20.3 mm)	20-24 PSI (138-165 kPa)	12-14 PSI (83-97 kPa)
30433	2003-2004	48.3	44.2	82.3	528 (239 KG)	9 X 3.5 - 4" (23 X 9 – 10 cm)	16x6.50" – 8 (40.6x16.5 – 20.3 mm)	20-24 PSI (138-165 kPa)	12-14 PSI (83-97 kPa)
30434	2003-2004	58.7"	44.2"	81.5"	546 (248 KG)	9 X 3.5 - 4" (23 X 9 – 10 cm)	16x6.50" – 8 (40.6x16.5 – 20.3 mm)	20-24 PSI (138-165 kPa)	12-14 PSI (83-97 kPa)

Model	Years	Width	Height	Length	Weight (lbs.)	Tire Dimensions		Tire Pressure	
						Front	Rear	Front	Rear
30435	2003-2004	58.7"	44.2"	81.5"	576 LBS (261 KG)	9 X 3.5 - 4" (23 X 9 – 10 cm)	16x6.50" – 8 (40.6x16.5 – 20.3 mm)	20-24 PSI (138-165 kPa)	12-14 PSI (83-97 kPa)
30436	2003	66.6"	44.2"	82.3"	650 LBS (295 KG)	9 X 3.5 - 4" (23 X 9 – 10 cm)	16x6.50" – 8 (40.6x16.5 – 20.3 mm)	20-24 PSI (138-165 kPa)	12-14 PSI (83-97 kPa)
30437	2004	58.7	44.2	81.5	496	9 X 3.5 - 4" (23 X 9 – 10 cm)	16x6.50" – 8 (40.6x16.5 – 20.3 mm)	20-24 PSI (138-165 kPa)	12-14 PSI (83-97 kPa)
30438	2004	66.6	44.2	82.3	570	9 X 3.5 - 4" (23 X 9 – 10 cm)	16x6.50 – 8" (40.6x16.5 – 20.3 mm)	20-24 PSI (138-165 kPa)	12-14 PSI (83-97 kPa)
30439	2004	58.7	44.2	81.5	546	9 X 3.5 - 4" (23 X 9 – 10 cm)	16x6.50 – 8" (40.6x16.5 – 20.3 mm)	20-24 PSI (138-165 kPa)	12-14 PSI (83-97 kPa)
30440	2004	58.7	44.2	81.5	576	9 X 3.5 - 4" (23 X 9 – 10 cm)	16x6.50 – 8" (40.6x16.5 – 20.3 mm)	20-24 PSI (138-165 kPa)	12-14 PSI (83-97 kPa)
30441	2004	66.6	44.2	82.3	650	9 X 3.5 - 4" (23 X 9 – 10 cm)	16x6.50 – 8" (40.6x16.5 – 20.3 mm)	20-24 PSI (138-165 kPa)	12-14 PSI (83-97 kPa)
30518	2004	32.0"	40"	78"	420	9 X 3.5 - 4" (23 X 9 – 10 cm)	13 x 5.0-6	20-24 PSI (138-165 kPa)	15 PSI (103 kPa)
30519	2004	35.6"	41"	78"	430	9 X 3.5 - 4" (23 X 9 – 10 cm)	13x6.50"-6	20-24 PSI (138-165 kPa)	15 PSI (103 kPa)
30520	2002-2003	32.0"	40.0"	78"	420	9 X 3.5 - 4" (23 X 9 – 10 cm)	13x6.50"-6	25-30 PSI (172-207 kPa)	15 PSI (103 kPa)
30521	2002-2003	35.6"	41.0"	78"	430	9 X 3.5 - 4" (23 X 9 – 10 cm)	13x6.50"-6	25-30 PSI (172-207 kPa)	15 PSI (103 kPa)
30523	2002-2004	35.0"	41"	72"	475	9 X 3.5 - 4" (23 X 9 – 10 cm)	6.5" X 13"	20-24 PSI (138-165 kPa)	15 PSI (103 kPa)
30524	2002-2004	46.1	43.2"	78"	433	9 X 3.5 - 4" (23 X 9 – 10 cm)	16x6.50 – 8" (40.6x16.5 – 20.3 mm)	20-24 PSI (138-165 kPa)	12-14 PSI (83-97 kPa)
30526	2002-2003	58.2"	43.2"	73"	483	9 X 3.5 - 4" (23 X 9 – 10 cm)	16x6.50 – 8" (40.6x16.5 – 20.3 mm)	20-24 PSI (138-165 kPa)	12-14 PSI (83-97 kPa)
30527	2003-2004	46.1"	43.2	78"	430	9 X 3.5 - 4" (23 X 9 – 10 cm)	16x6.50 – 8" (40.6x16.5 – 20.3 mm)	20-24 PSI (138-165 kPa)	12-14 PSI (83-97 kPa)
30528	2003-2004	58.2"	43.2"	73"	483	9 X 3.5 - 4" (23 X 9 – 10 cm)	16x6.50 – 8" (40.6x16.5 – 20.3 mm)	20-24 PSI (138-165 kPa)	12-14 PSI (83-97 kPa)
30529	2003-2004	35.6"	41"	78"	430	9 X 3.5 - 4" (23 X 9 – 10 cm)	6.5" X 13"	20-24 PSI (138-165 kPa)	15 PSI (103 kPa)
30530	2003-2004	35.0"	41"	72"	475	9 X 3.5 - 4" (23 X 9 – 10 cm)	6.5" X 13"	20-24 PSI (138-165 kPa)	15 PSI (103 kPa)
30531	2004	35.0"	41"	72"	475	9 X 3.5 - 4" (23 X 9 – 10 cm)	6.5" X 13"	20-24 PSI (138-165 kPa)	15 PSI (103 kPa)

Model	Years	Width	Height	Length	Weight (lbs.)	Tire Dimensions		Tire Pressure	
						Front	Rear	Front	Rear
30172TE	2001	48.31	44.1	83.55	250 (113 KG)	11"x4.00-5"	16x6.50" – 8 (40.6x16.5 – 20.3 mm)	NA	12-14 PSI (83-97 kPa)
30250TE	2001	48.31	44.1	83.55	469 (213 KG)	11"x4.00-5"	16x6.50" – 8 (40.6x16.5 – 20.3 mm)	20-24 PSI (138-165 kPa)	12-14 PSI (83-97 kPa)
30261TE	2003-2004	48.3	45.5	80.5	469 (213 KG)	9x3.5-4 (23x9-10cm)	16x6.50" – 8 (40.6x16.5 – 20.3 mm	20-24 PSI (138-165 kPa)	12-14 PSI (83-97 kPa)
30291TE	2001	58.73	44.1	79.92	560 (254 KG)	11"x4.00-5"	16x7.50" – 8 (40.6x19.4 – 20.3 mm)	20-24 PSI (138-165 kPa)	12-14 PSI (83-97 kPa)
30528	2003-2004	58.2"	43.2"	73"	483	9 X 3.5 - 4" (23 X 9 – 10 cm)	16x6.50 – 8" (40.6x16.5 – 20.3 mm)	20-24 PSI (138-165 kPa)	12-14 PSI (83-97 kPa)

Model ID

T-Bar / Gear Drive / Fixed Deck	Pistol Grip / Gear Drive / Fixed Deck	Pistol Grip / Hydo Drive / Fixed Deck	Classic T-Bar / Gear / Traction Unit Only	Classic T-Bar / Gear Drive / Floating Deck
30140	30518	30524	30119	30316
30150	30519	30526	30159	
30161	30520	30527	30165	
30164	30521	30528	30167	
30171	30523		30168	
30178	30529		30169	
30184	30530		30177	
30193	30531		30182	
30194			30183	
30195			30185	
30196			30225	
30197				

Classic T-Bar / Hydro Drive / Traction Unit Only	T-Bar / Gear Drive / Floating Deck	Pistol Grip / Gear Drive / Floating Deck	T-Bar / Hydro Drive / Floating Deck	Pistol Grip / Hydro Drive / Floating Deck
30187	30250	30329	30290	30339
30188	30251	30332	30291	30340
30189	30253	30333	30292	30341
30191	30254	30334	30297	30433
30192	30255	30335	30296	30434
*30299TE	30257	30430	30291TE	30435
	30258	30431		30436
	30259	30432		30338
	30260	30437		30439
	30317	30438		30440
	30318			30441
	30319			
	30320			
	30321			
	30322			
	30326			
	30327			
	30342			
	30172TE			
	30250TE			
	30261TE			
	30314TE			

Maintenance Schedule, Floating Deck Models

Maintenance Service	Interval Maintenance Procedure
Each Use	• Engine Oil—check level • Safety System—check • Brake—check • Engine—clean outside • Mower Housing—clean
8 Hours	• Engine Oil—change • Cutting Blades—check • Mower Housing—clean • Caster Wheels—grease
25 Hours	• Foam Air Cleaner—clean[1] • Paper Air Cleaner—check, replace if dirty
40 Hours	• Deck Belt Idler Arm—grease • Deck Belt Idler Arm—grease • Tires—check pressure • Hydraulic Oil—check
50 Hours	• Belts—check for wear/cracks
100 Hours	• Engine Oil—change[1] • Spark Plug(s)—check • Electric Clutch–Adjust • Engine—clean outside • Paper Air Cleaner—replace[1]
200 Hours	• Engine Oil Filter—change (200 hours or every other oil change) • Fuel Filter—replace
250 Hours	• Transmission Couplings—grease[1]
400 Hours	• Wheel Bearings—grease[1]
At Storage	• Chipped Surfaces—paint • Perform all maintenance procedures listed above before storage

[1]More often in dusty, dirty conditions.

Maintenance Schedule, Fixed Deck Models

Service Operation	Each Use	8 Hours	25 Hours	50 Hours	100 Hours	200 Hours	Storage Service
Oil—check level	X						X
Oil—change*		Initial			X		X
Oil Filter—change (200 hours or every other oil change)						X	X
Safety System—check	X						X
Brakes—check	X						X
Cutting Blades — check		X			X		X
Wheel Bearings—grease*	X						X
Transmission Couplers — grease*				X			X
Idler Pivots — grease*	X						X
Belt Blade Idler Pivots — grease*				X			X
Foam Air Cleaner—service*			X				X
Paper Air Cleaner—replace*					X		X
Spark Plug(s)—check						X	X
Belts—check for wear/cracks				X			X
PTO Belt—check tension		Initial		X			X
Gasoline—drain							X
Engine—clean cooling system	X				X		X
Fuel Filter—replace						X	X
Tires—check pressure				X			X
Chipped Surfaces—paint							X
* More often in dusty, dirty conditions							

THIS PAGE INTENTIONALLY LEFT BLANK

Engine Removal

1. Turn the fuel valve to the “off” position.

2. Drain the engine oil into a suitable container.

3. Remove the fuel line by sliding clamp down and remove the line from fuel pump (Figure 3). Drain fuel in line into a suitable container.

Figure 3 mvc-048

4. Remove bolt that clamps the fuel line to engine block (Figure 4).

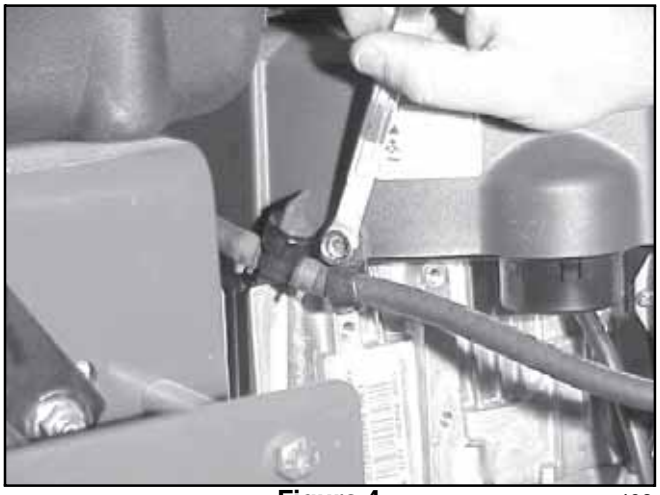


Figure 4 mvc-409

5. Slide the wiring out from under the clip on the air shroud.

6. Cut the tie wrap and disconnect the mag wire (red from black) bullet connector (Figure 5).

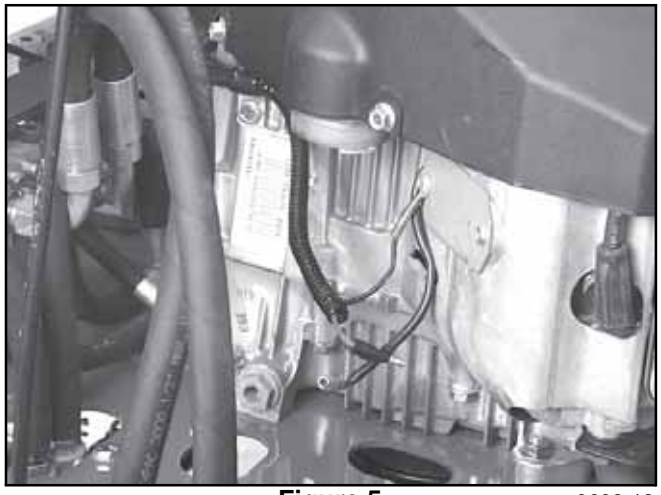


Figure 5 0602-12

7. Remove the screw attaching the ground wire to the air shroud.

8. Remove the bolt securing the harness to the engine block.

9. Pull the harness out from behind the oil fill tube and move it away from the engine to prevent damage.

On Floating Deck Models:

10. Disconnect the alternator wire connector (red to pink) (Figure 6).

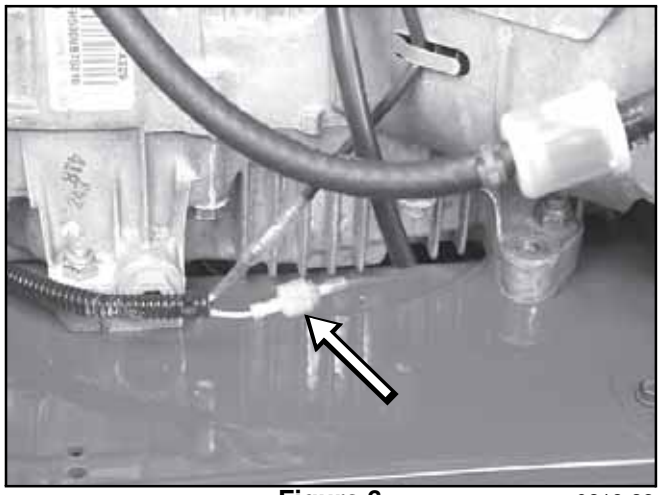


Figure 6 0819-32

11. Separate the electric clutch connector and push the connector and grommet through the frame (Figure 7).

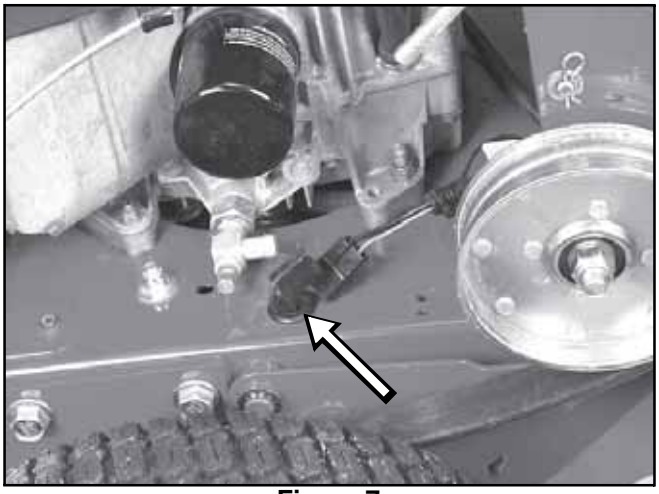


Figure 7 0819-30

12. Remove the air cleaner cover.

13. Then remove the clamps holding the throttle and choke cables to the engine (Figure 8). Mark the cable housings for the clamp locations to assist in reassembly. Remove the throttle and choke cables.

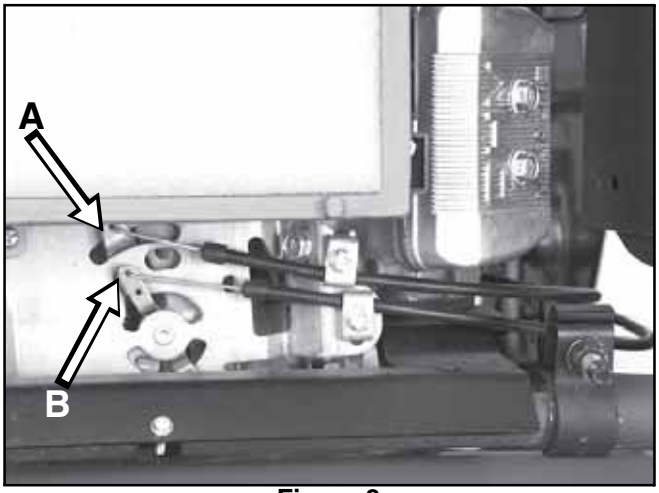


Figure 8 0602-10

(A) Choke	(B) Throttle

14. Remove the drive pulleys.

15. If the unit is up, no need to remove the deck covers.

16. Remove deck drive belt from deck idler and drive pulley (Figure 9).

Figure 9 mvc-412

17. Remove hydro pump drive belt (Figure 10).

Figure 10 mvc-415

18. Remove PTO clutch arm from housing (Figure 11).

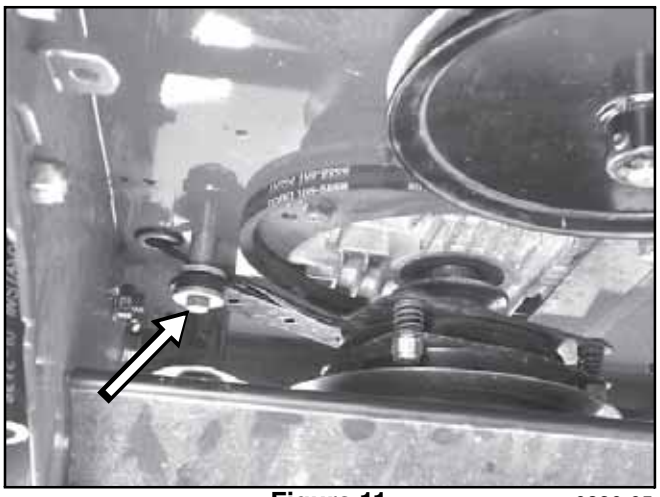


Figure 11 0820-05

19. Sometimes it is necessary to remove the PTO clutch brake pulley to have better access for removing the clutch bolt (Figure 12 and Figure 14).

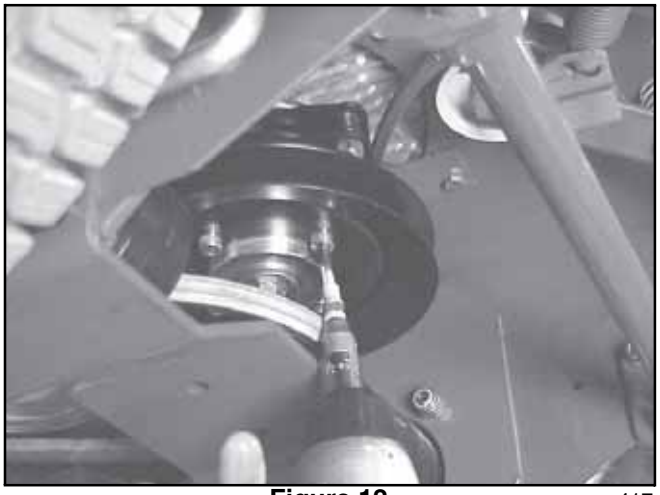


Figure 12 mvc-417

20. On gear drive models, remove the V belt from the transmission sheave (Figure 13).

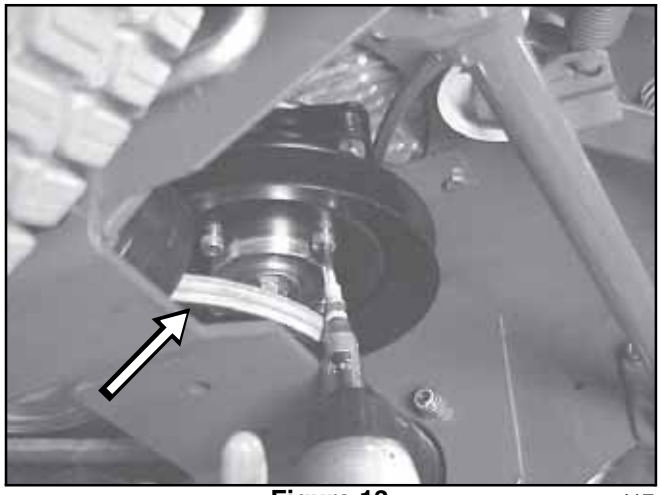


Figure 13 mvc-417

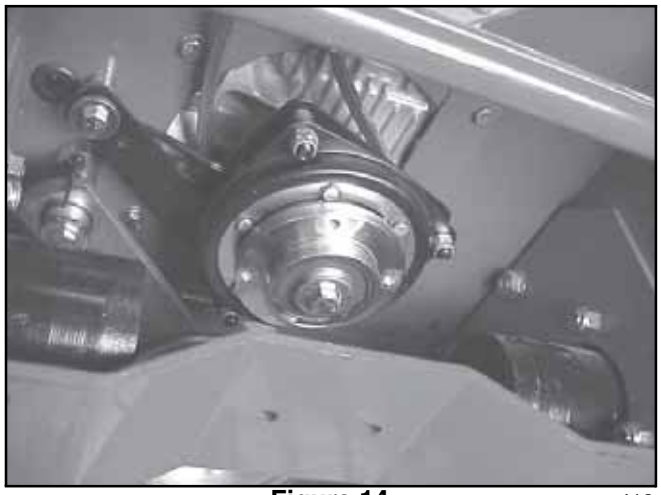


Figure 14 mvc-418

21. Remove pulley cover (Figure 15).

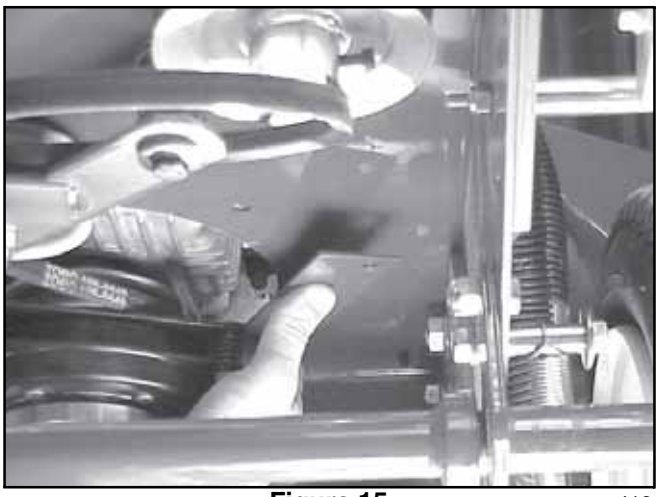


Figure 15 mvc-419

22. Unbolt clutch bolt, remove clutch and engine pulley (Figure 16 and Figure 17).

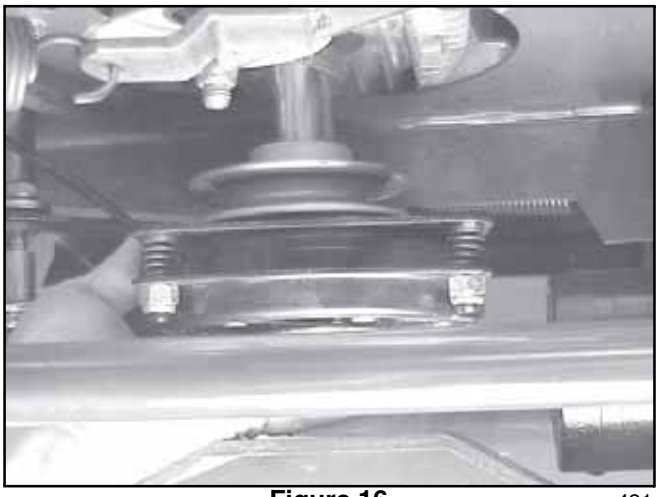


Figure 16 mvc-421

Figure 17 mvc-424

23. Remove the nuts and bolts that mount engine to chassis (Figure 18).

Figure 18 mvc-423

Reverse order for reassembly - Torque clutch bolt to 55 to 60 ft. lbs. (75 to 81 N-m).

On Fixed Deck Models:

1. Engage the PTO and block the mower blades to prevent the crankshaft from turning (Figure 19).

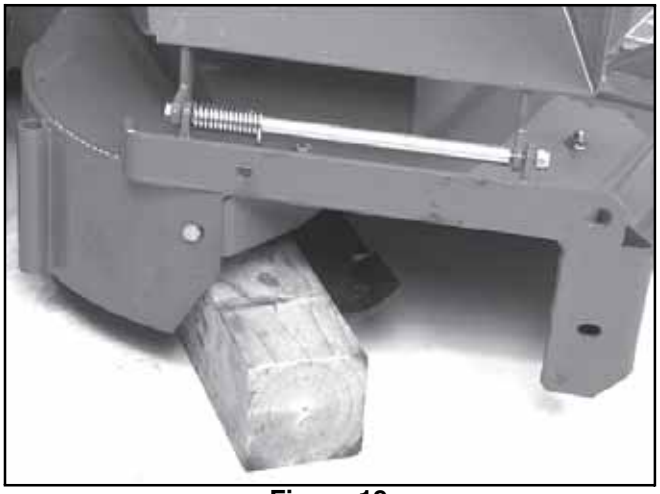


Figure 19 0602-11

2. Then loosen the pulley bolt (Figure 20).

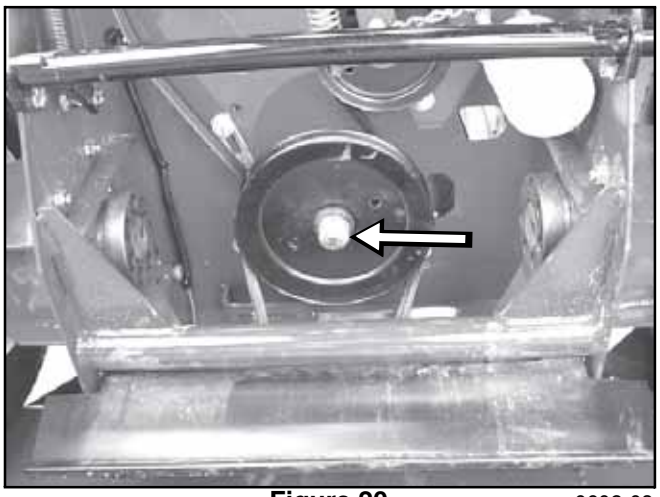


Figure 20 0602-08

3. Remove tension from the hydraulic pump belt by using the cold start assist ring (Figure 21).

Figure 21 0602-09

4. Disengage the PTO. Finish removing the pulley bolt along with the 4 washers.

5. Slide the PTO pulley, 2 spacers, and the pump drive pulley from the crankshaft, taking care not to lose the 2 keys which locate the pulleys on the crankshaft.

6. Mark the position of the belt guide attached with the left rear mounting bolt (Figure 22).

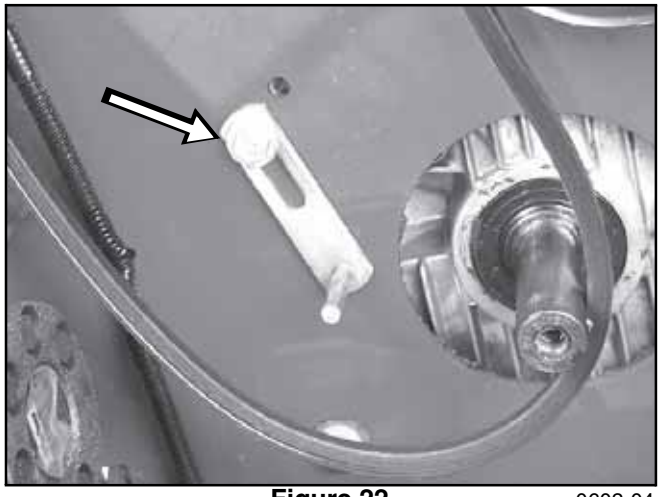


Figure 22 0602-04

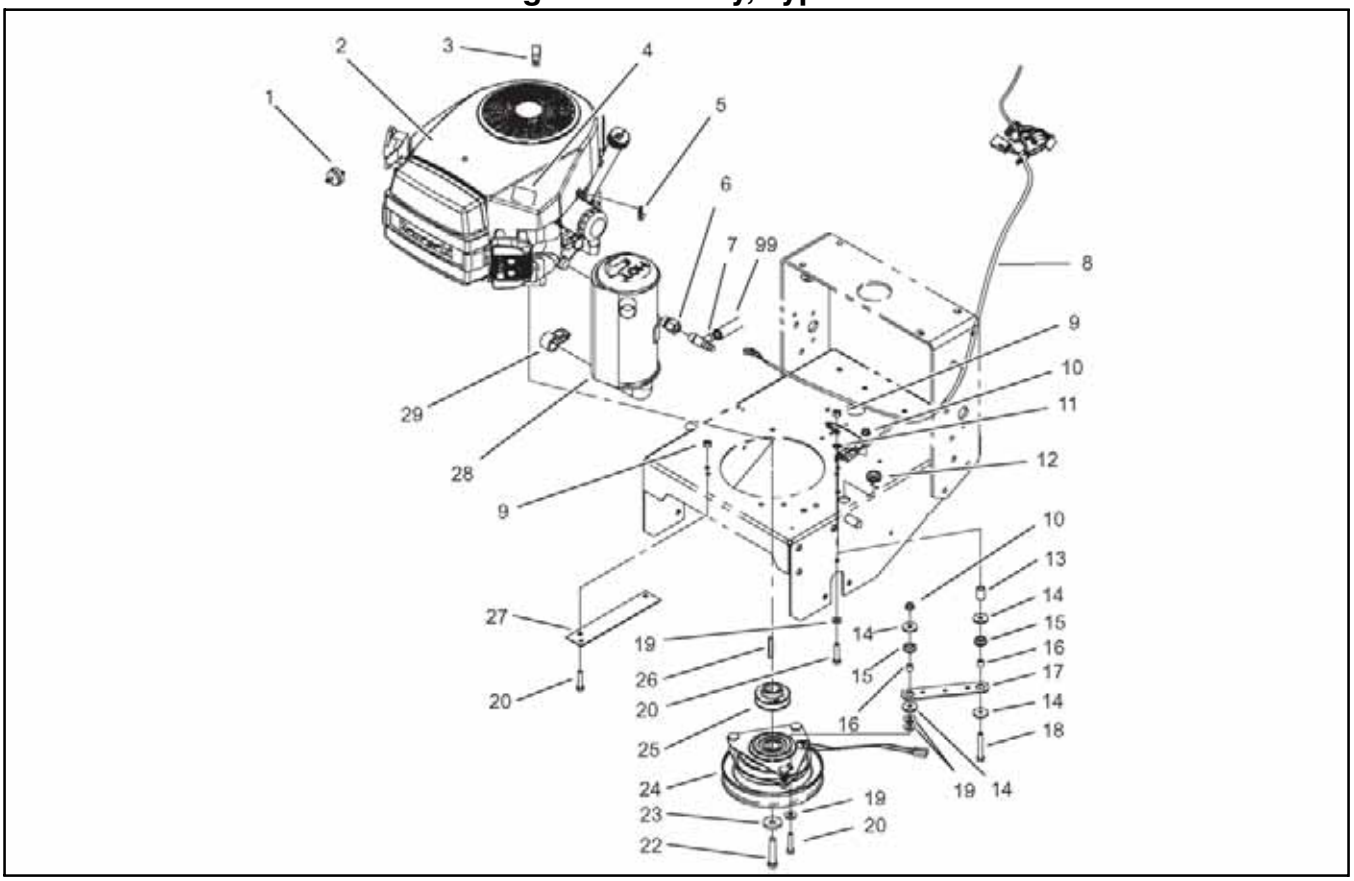
7. Remove the 4 engine mounting bolts and remove the engine from the chassis.

Engine Installation

Follow the removal procedures in reverse.

ENGINE

Engine Assembly, Typical



Ref. No.	Qty.	Description
1	1	Filter - Fuel
*2	1	Engine - Kawasaki, Fh500v-As29
3	1	Clamp - Cable
4	1	Decal - Warning, Hot Surfaces
5	1	Clip - Closed, Insulated
6	1	Adapter
7	1	Valve - Drain, Oil
8	1	Harness - Wire
9	4	Nut - Lock, NI
10	2	Nut - HF
11	1	Washer - Lock
12	1	Grommet
13	1	Tube - Retainer
14	4	Washer
15	2	Grommet - Brake

Ref. No.	Qt.	Description
16	2	Spacer - Grommet
17	1	Strap - Clutch/Brake
18	1	Screw - HH
19	5	Washer - Flat
20	5	Screw - HH
22	1	Screw - HH
23	1	Washer
24	1	Clutch/Brake
25	1	Pulley - Drive
26	1	Key - Square
27	1	Cover - Pulley
28	1	Muffler
29	1	Clamp - Muffler
99	1	Hose - Drain, Oil

* Not serviced separately

Model and Serial Number Location

The model and serial number plate is located on the traction unit. (Figure 23 and Figure 24).

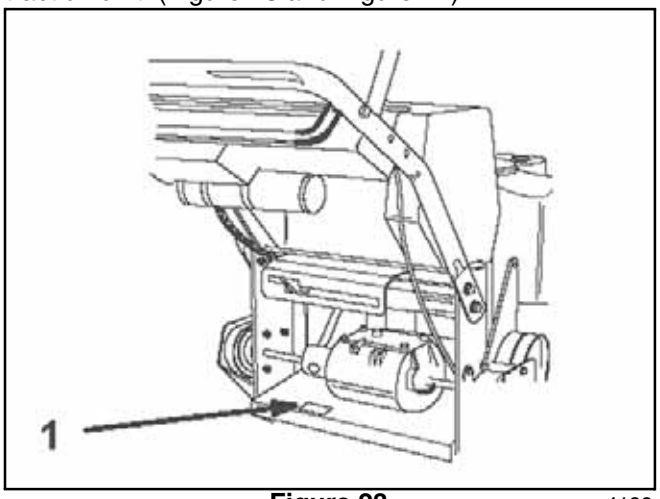


Figure 23 m-4189

(1) Location of the model and serial numbers on Floating Deck

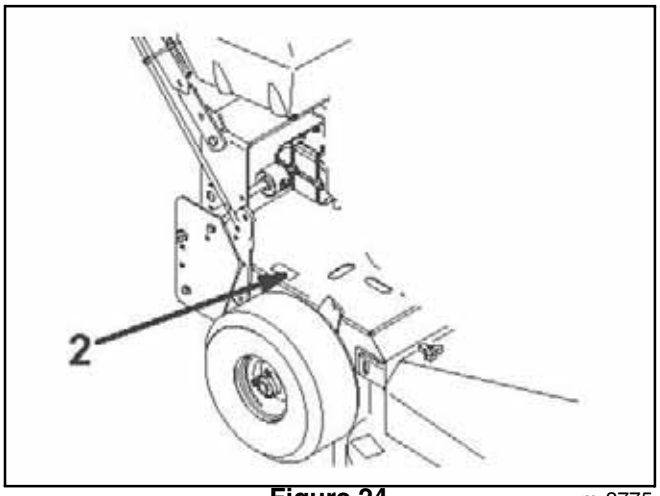


Figure 24 m-3775

(2) Location of the model and serial numbers on Fixed Deck

Engine Model and Serial Number Identification

Consult the appropriate engine manufacturer's service literature for the location of the engine model and serial number information.

Greasing and Lubrication

Service Interval/Specification

Refer to the **Check Service Reference Aid** decal for location and interval of greasing and lubrication (Figure 25).

Grease with No. 2 general purpose lithium base or molybdenum base grease.

How to Grease

1. Disengage the power take off (PTO), set the parking brake, and turn the ignition key to off. Remove the key.
2. Clean the grease fittings with a rag. Make sure to scrape any paint off the front of the fitting(s).
3. Connect a grease gun to the fitting. Pump grease into the fittings until grease begins to ooze out of the bearings.
4. Wipe up any excess grease.

Where to Add Grease

Lubricate the grease fittings as shown on the **Check Service Reference Aid** decal (Figure 25).

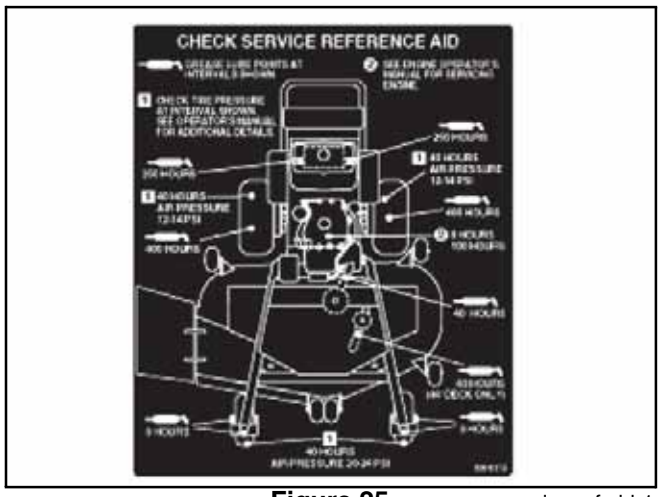


Figure 25 service ref aid-1

Lubricating the Castor and Wheel Bearings

1. Lubricate the front wheel bearings and front spindles until grease begins to ooze out of the bearings (Figure 26).

2. Remove rear wheel grease cap. Lubricate the rear wheel bearing (Figure 26).

Note: Make sure the rear wheel grease caps are removed before lubricating rear wheels.

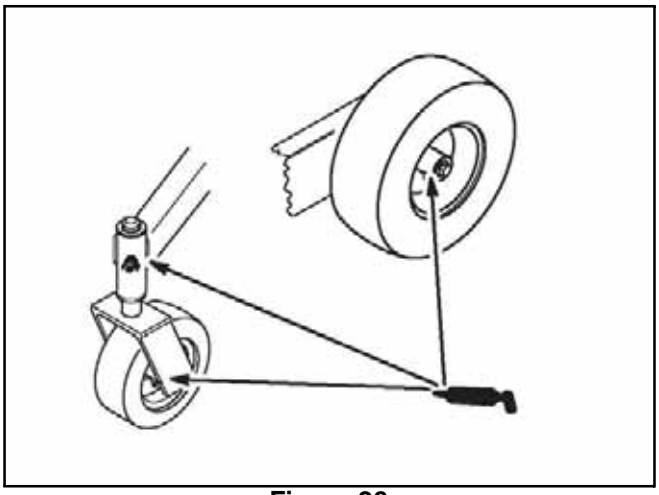


Figure 26 m-2147

Lubricating the Transmission Couplers

1. Lubricate the transmission couplers located in the back of the machine with general purpose grease (Figure 27).

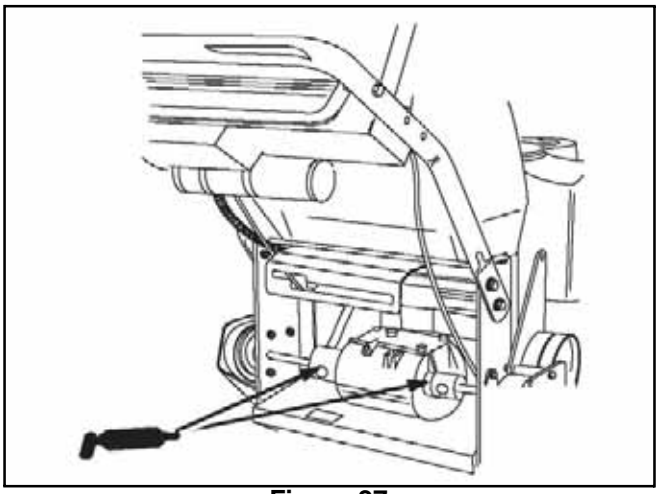


Figure 27 m-5191

Greasing the PTO Drive Belt Idler and Deck Belt Idler

1. Stop the engine, set the parking brake, remove the key and disconnect the spark plug wire(s) from the spark plug(s).

2. Grease the idler pulley pivots (Figure 28).

   Note: You'll have to remove the carrier covers to access the grease fitting for the deck.
3. Grease the idler pulley pivots (Figure 28).

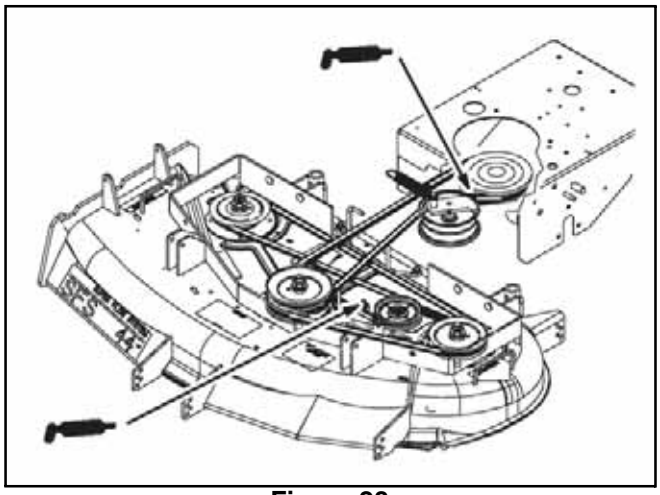


Figure 28 m-5194

Cleaning the Cooling System

Service Interval/Specification

Before each use, check and clean engine cooling system. Remove any build-up of grass, dirt or other debris from the cylinder and cylinder head cooling fins, air intake screen on flywheel end, and carburetor-governor levers and linkage. This will help insure adequate cooling and correct engine speed and will reduce the possibility of overheating and mechanical damage to the engine.

Brake Service

Service Interval/Specification

Before each use, check brakes for proper operation.

Always set the parking brake when you stop the machine or leave it unattended. If the parking brake does not hold securely, an adjustment is required.

Pistol Grip - Gear Drive - Fixed Deck

Checking the Brake

1. Park the machine on a level surface, disengage the blade control (PTO) and push the neutral/brake lock forward to set the brake.
2. Rear wheels must lock when you try to push the machine forward or backward. Adjustment is required if the wheels turn and do not lock. Refer to ”Adjusting the Brake" on page 4 - 3.
3. Release the brake and move neutral/brake lock to neutral. Move the machine slightly, approximately 1/2 in. (13mm). Wheels should rotate freely.
4. If both conditions are met, no adjustment is required.

Adjusting the Brake

If the parking brake does not hold securely, an adjustment is required.

1. Check the brake before you adjust it; refer to ”Pistol Grip - Gear Drive - Fixed Deck" on page 4 - 3.
2. Release the parking brake.
3. To adjust brake, rotate the wing nuts on the brake rods (Figure 29). Rotate clockwise to tighten the brake and counterclockwise to loosen the brake.
4. Position wing nut so the brakes will engage when the drive levers are squeezed enough to place neutral/brake lock forward and set the brake.
5. Check the brake operation again; refer to ”Pistol Grip - Gear Drive - Fixed Deck" on page 4 - 3.

Important With the parking brake released, the rear wheels must rotate freely when you push the mower. If brake action and free wheel rotation cannot be achieved, contact your service dealer immediately.

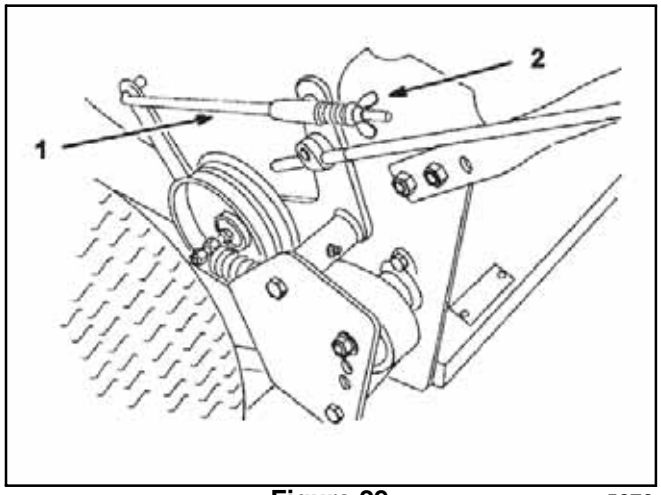


Figure 29 m-5372

(1) Brake rod	(2) Wing nut

Pistol Grip - Gear Drive - Floating Deck

Checking the Brake

1. Park the machine on a level surface, disengage the PTO.
2. Stop the engine, remove the key and wait for all moving parts to stop before leaving the operating position.
3. Push the neutral/brake lock forward to set the brake.
4. Rear wheels must lock when you try to push the machine forward or backward. Adjustment is required if the wheels turn and do not lock. Refer to ”Adjusting the Brakes" on page 4 - 4.

5. Release the brake and move the neutral/brake lock to the neutral position. Move the machine lightly, approximately 1/2 in. (13mm). Wheels should rotate freely.

6. If both conditions are met, no adjustment is required.

Adjusting the Brakes

The brake lever is on the upper control bar (Figure 31). If the parking brake does not hold securely, an adjustment is required.

Note: For the initial adjustment, adjust the wing nut until it is 1-1/4 inches (32mm) from the top of the rod (Figure 30).

1. Park the machine on a level surface, disengage the PTO, and set the parking brake.

2. Stop the engine, remove the key, and wait for all moving parts to stop before leaving the operating position.

3. Check the brake before you adjust it; refer to ”Checking the Brake" on page 4 - 3.

4. Release the parking brake; refer to ”Releasing the Parking Brake" on page 4 - 4.

5. To adjust the brake remove the hair pin cotter and washer from the bell crank and trunnion (Figure 30).

6. Rotate the wing nut clockwise to increase the braking pressure.

7. Rotate the wing nut counterclockwise to decrease the braking pressure.

8. Install the trunnion into the hole for the brake rod (Figure 30). Tighten the wing nut.

9. Secure trunnion to brake lever with washer and hair pin cotter (Figure 30).

10. Check the brake operation again refer to ”Checking the Brake" on page 4 - 3.

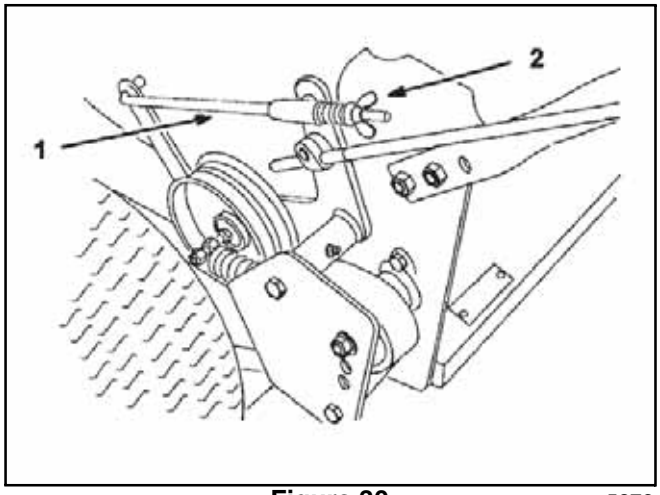


Figure 30 m-5372

(1) Brake rod	(2) Wing nut

Releasing the Parking Brake

1. Squeeze the drive levers back to the grip (Figure 31).

2. Place thumbs on the upper part of locks and rotate them rearward until in forward speed slot (Figure 31).

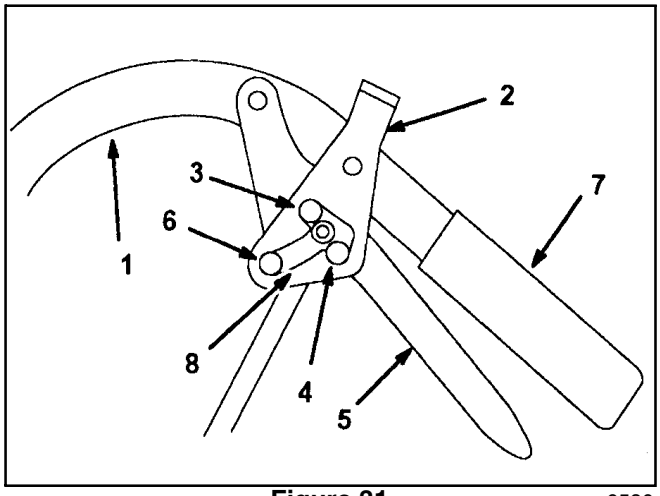


Figure 31 m-6580

(1) Handle	(5) Drive lever
(2) Neutral/parking brake lock	(6) Full speed forward position
(3) Park position	(7) Grip
(4) Neutral position	(8) Forward speed slot

Pistol Grip - Hydro - Fixed Deck

Checking the Parking Brake

1. Move the machine onto a level surface.
2. Disengage the power take off (PTO) and stop the engine.
3. Set the parking brake.

Note: Setting the parking brake should take a reasonable amount of force. If it engages too hard or too easily, adjustment is required. Refer to ”Adjusting the Parking Brake" on page 4 - 5.

Adjusting the Parking Brake

The parking brake lever is on the right side of the machine (Figure 32). If the parking brake does not hold securely, adjust it.

1. Check the parking brake before you adjust it; refer to ”Checking the Parking Brake" on page 4 - 5.
2. Release the parking brake; refer to ”Releasing the Parking Brake" on page 4 - 4.
3. Remove the hair pin cotter and the clevis pin from the lower brake lever (Figure 32).
4. Rotate the brake linkage yoke in to tighten the parking brake; rotate the brake linkage yoke out to loosen the parking brake (Figure 32).

Note: There should be approximately 1/4 inch (6.3mm) clearance between the tire and the flat bar when the parking brake is in the released position (Figure 32).

5. Secure the brake linkage yoke to the lower brake lever with the hair pin cotter and the clevis pin (Figure 32).
6. Check the brake operation again; refer to ”Checking the Parking Brake" on page 4 - 5.

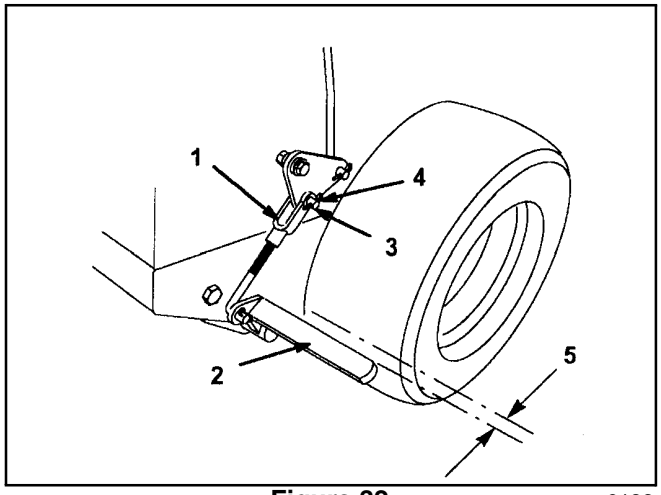


Figure 32 m-6182

(1) Brake linkage yoke	(3) Clevis pin
(2) Flat bar (parking brake lever in the released position)	(4) Hair pin cotter
	(5) 1/4 in. (6 mm)

Pistol Grip - Hydro - Floating Deck

Checking the Brake

1. Park the machine on a level surface.
2. Disengage the PTO and set the parking brake.
3. Stop the engine, remove the key, and wait for all moving parts to stop before leaving the operating position.
4. To set the parking brake, it should take a reasonable amount of force. If it engages too hard or easily, adjustment is required. Refer to ”Adjusting the Brake" on page 4 - 6.

Note: When the brake is engaged, the brake handle should be close to the 1 o’clock position.

5. If there is a reasonable amount of force, no adjustment is required.

Adjusting the Brake

The brake handle is on the left side of the machine (Figure 33). If the parking brake does not hold securely, and adjustment is required.

1. Check the brake before you adjust it; refer to ”Checking the Brake" on page 4 - 5.

2. Release the parking brake; refer to ”Releasing the Parking Brake" on page 4 - 4.

3. Loosen the top and bottom jam nuts (Figure 33).

4. To adjust the brake, remove the hair pin cotter and clevis pin from the lower brake lever (Figure 33).

5. Rotate the brake rod in the yokes. To tighten the brake, lengthen the rod between the yokes. To loosen the brake, shorten the rod between the yokes (Figure 33).

Note: The brake rod should be threaded into both yokes the same distance.

6. Secure the yoke to lower brake lever with the hair pin cotter and clevis pin (Figure 33).

7. Tighten the top and bottom jam nuts (Figure 33).

8. Check the brake operation again, refer to ”Checking the Brake" on page 4 - 5.

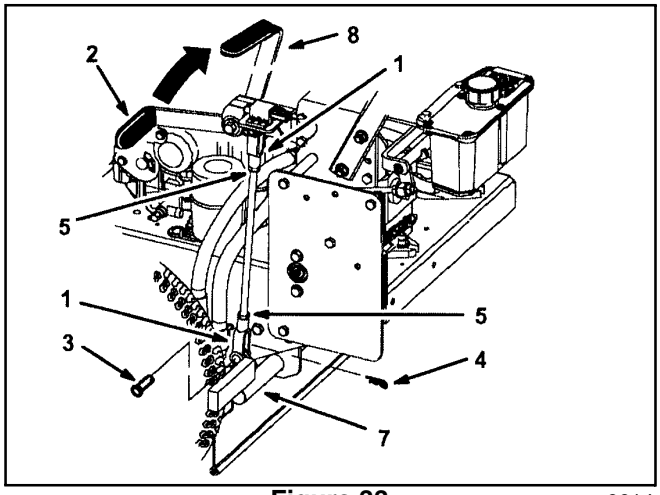


Figure 33 m-6614

(1) Yoke	(5) Jam nut
(2) Parking brake lever (released position)	(6) Brake rod
	(7) Lower brake lever
(3) Clevis pin	(8) 1 o’clock position
(4) Hair pin cotter	

T-Bar - Gear Drive - Fixed Deck

Checking the Brake

1. Park the machine on a level surface, disengage the blade control (PTO) and set the parking brake.

2. Rear wheels must lock when you try to push the machine forward or backward. Adjustment is required if the wheels turn and do not lock; refer to ”Adjusting the Brake" on page 4 - 7.

3. Release the brake and press the upper control bar very lightly, approximately 1/2 inch (13mm), wheels should rotate freely.

4. If both conditions are met, no adjustment is required.

Adjusting the Brake

The brake lever is on the upper control bar (Figure 34). If the parking brake does not hold securely, an adjustment is required.

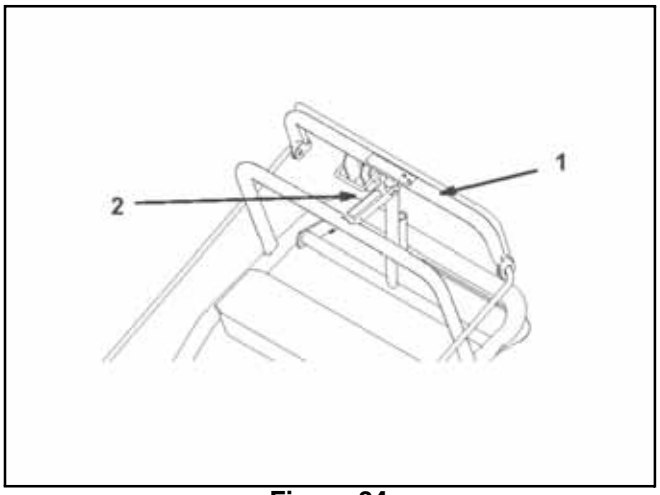


Figure 34

(1) Upper control bar	(2) Parking brake lock

1. Check the brake before you adjust it; refer to ”Checking the Brake" on page 4 - 6.

2. Release the parking brake; refer to ”Releasing the Parking Brake" on page 4 - 4.

3. To adjust the brake, set the parking brake latch, and rotate the wing nuts on the brake rods (Figure 35). Clockwise to tighten the brake and counterclockwise to loosen the brake.

Note: The control bar should be parallel with reference bar when properly adjusted.

4. Check the brake operation again; refer to ”Checking the Brake" on page 4 - 6.

Important With the parking brake released, the rear wheels must rotate freely when you push the mower. If the brake action and free wheel cannot be achieved, examine the brake system components for wear or damage.

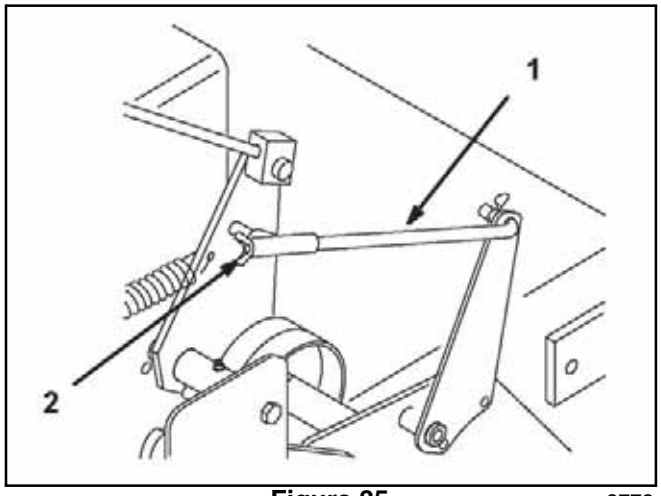


Figure 35 m-3773

(1) Brake rod	(2) Wing nut

T-Bar - Gear Drive - Floating Deck

Checking the Brake

1. Park the machine on a level surface, disengage the PTO.

2. Stop the engine, remove the key, and wait for all moving parts to stop before leaving the operating position.

3. Apply the parking brake. The wheels must lock when you try to push the machine forward.

4. If the wheels do not lock, adjust the brakes. Refer to ”Adjusting the Brake" on page 4 - 8.

5. Release the brake and press upper control bar very lightly, approximately 1/2 inch (13mm). The wheels should rotate freely. If not; refer to ”Adjusting the Brake" on page 4 - 8.

Adjusting the Brake

The brake lever is on the upper control bar (Figure 36). If the parking brake does not hold securely, adjustment is required.

Note: For the initial adjustment, adjust the wing nut until it is 1-1/4 inches (32mm) from the top of the rod (Figure 37).

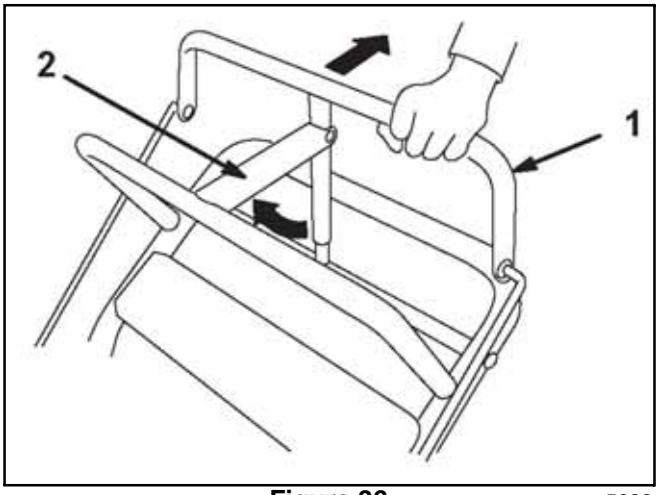


Figure 36 m-5233

(1) Upper control bar	(2) Parking brake lever (set position)

1. Park the machine on a level surface, disengage the PTO, and set the parking brake.
2. Stop the engine, remove the key, and wait for all moving parts to stop before leaving the operating position.
3. Check the brake before you adjust it; refer to ”Checking the Brake" on page 4 - 7.
4. Release the parking brake; refer to ”Releasing the Parking Brake" on page 4 - 4.
5. To adjust the brake, remove the hair pin cotter and washer from the brake lever and trunnion (Figure 37).
6. Rotate the wing nut clockwise to increase the braking pressure.
7. Rotate the wing nut counterclockwise to decrease the braking pressure.
8. Install the trunnion into hole **F** (Figure 37). Tighten the wing nut.
9. Secure trunnion to brake lever with washer and hair pin cotter (Figure 37).
10. Check the brake operation again; refer to ”Checking the Brake" on page 4 - 7.

Important With the parking brake released, the rear wheels must rotate freely when you push the mower. If brake action and free wheel rotation cannot be achieved, examine the brake system components for wear or damage.

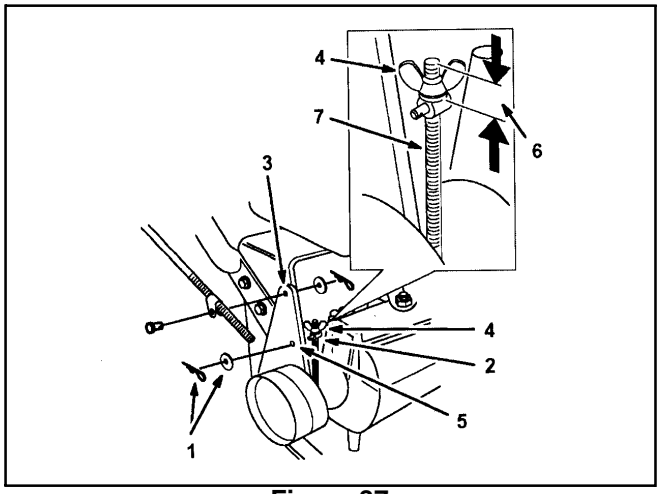


Figure 37 m-6512

(1) Hair pin cotter and washer	(5) Hole F
(2) Trunnion	(6) Initial adjustment - 1-1/4 inch (32 mm)
(3) Brake lever	(7) Rod
(4) Wing nut	

Brake Band (T-Bar - Gear Drive)

Removal

1. Turn the engine off and remove the high tension wire(s) from the spark plug(s).
2. Jack up the machine until the tire is off the floor. Support the machine with jack stands or blocks to prevent it from falling.
3. Remove rear wheel and tire from the wheel hub.
4. Remove the wheel hub from the axle.

5. Remove the drive belt from the pulleys.

6. Remove the dust cover, cotter pin, nut, and washer from the axle (Figure 38).

Figure 38 0819-03

7. Slide the hub with the pulleys and brake drum off the axle (Figure 39).

Figure 39 0819-05

8. Inspect the brake drum. Replace it if is severely scored.

9. Remove the hairpin cotter and disconnect the brake rod from the brake arm (Figure 40).

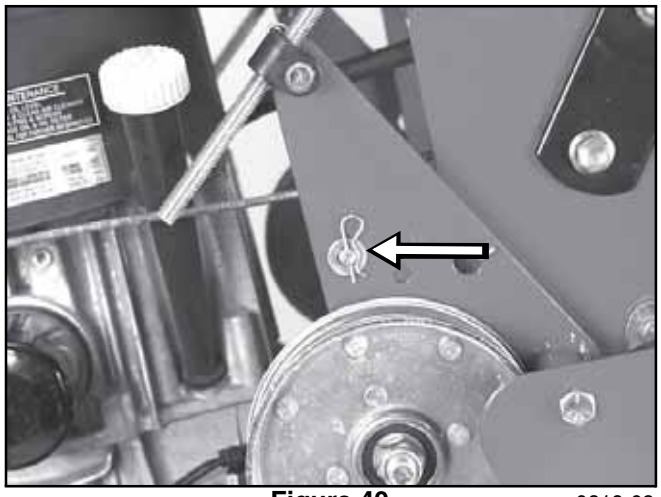


Figure 40 0819-02

10. Pry off the push nut securing the brake arm to the pivot (Figure 41).

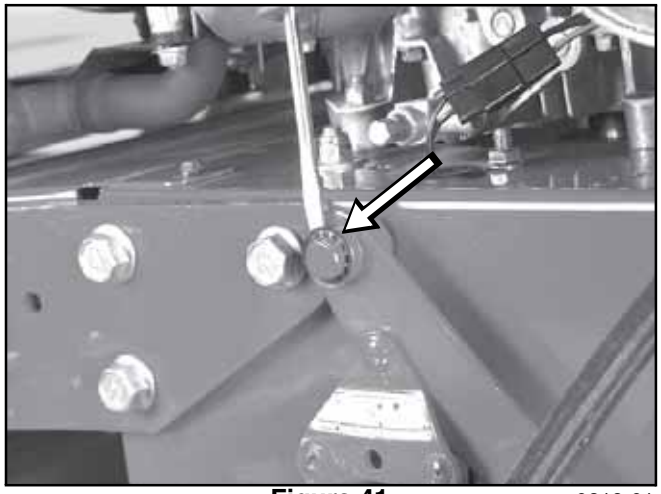


Figure 41 0819-01

11. Remove the 3 push nuts securing the brake band to the brake link (Figure 42). **Note:** Use all new push nuts when reassembling the brakes.

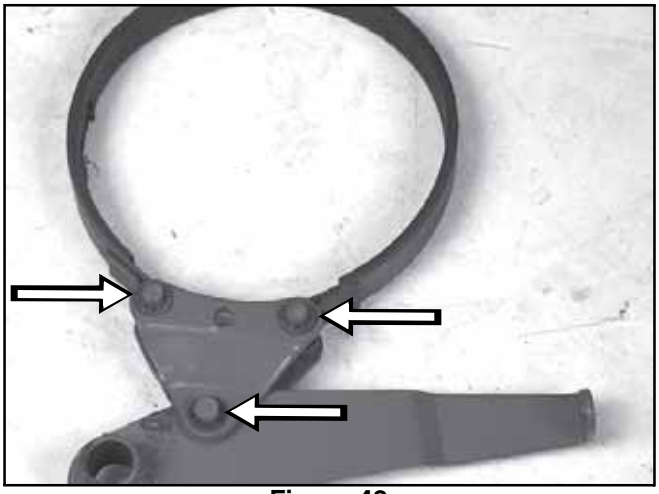


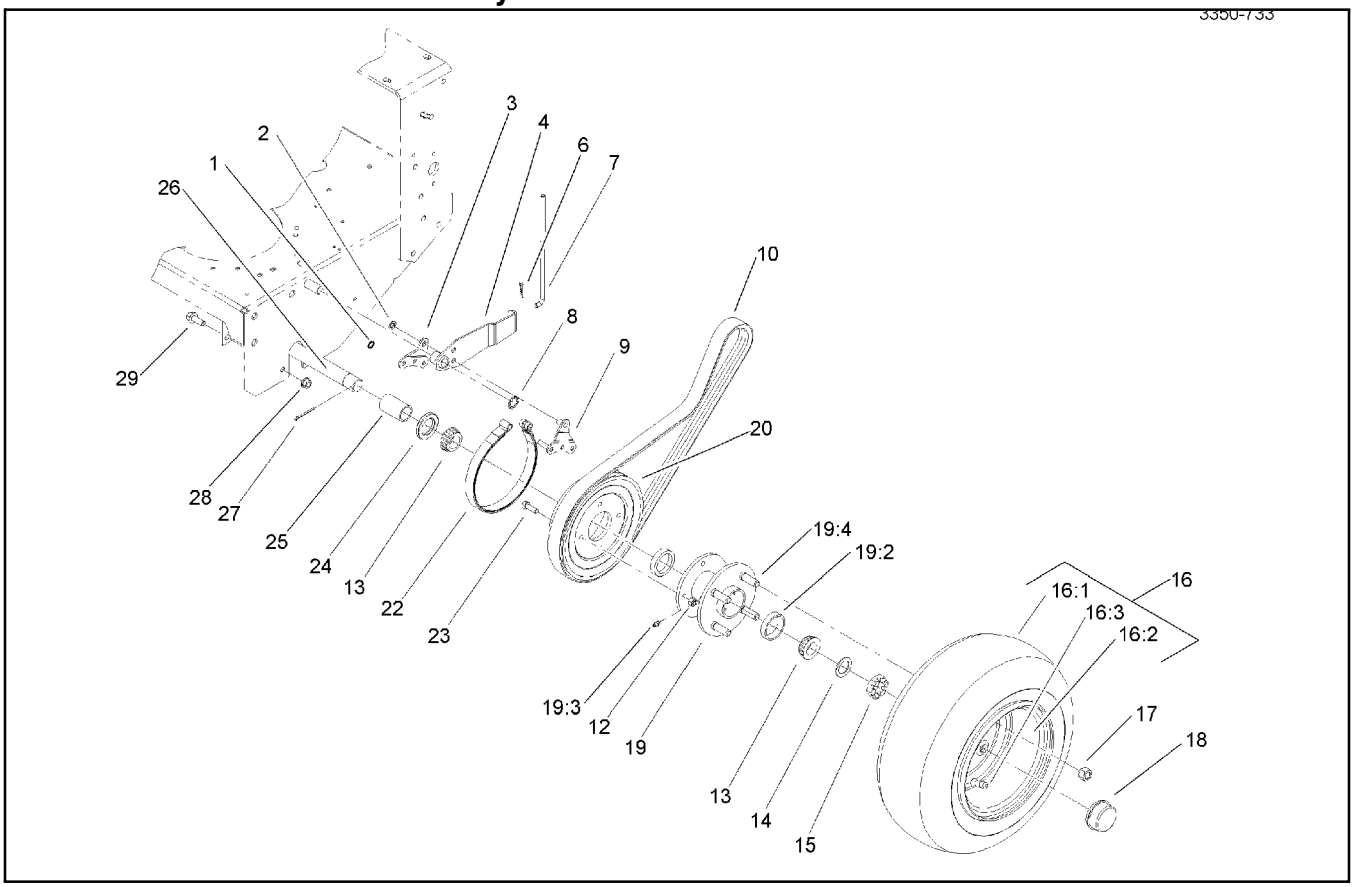
Figure 42 0819-06

Installation

Follow the removal procedures in reverse and check the brakes, ”Checking the Brake" on page 4 - 7.

Important Lubricate the brake link pivot pins and brake arm pivot with anti-seize compound during assembly.

Wheel Drive and Brake Assembly



Ref	Qty.	Description
1	4	Ring-Retaining
2	2	Ring-Retaining, External
3	2	Plate-Link, Brake
4	2	Brake Arm ASM
6	2	Pin-Hair
7	2	Rod-Brake
8	2	Ring-Retaining
9	2	Brake Link ASM
10	2	V-Belt
12	8	Nut-Lock, NI
13	4	Bearing-Cone, Tapered
14	2	Washer-Spacer
15	2	Nut-SHH
16	2	Wheel And Tire ASM
16:1	1	Tire
16:2	1	Wheel
16:3	1	Stem-Valve
17	8	Nut-Lug
18	2	Cap-Dust
19	2	Hub/wheel ASM
19:2	2	Bearing-Cup, Tapered
19:3	1	Fitting-Grease
19:4	4	Stud-Wheel
20	2	Pulley-Wheel

Ref	Qty.	Description
22	2	Band-Brake
23	8	Screw-HH
24	2	Seal-Grease
25	2	Spacer-W heel
26	1	Axle ASM
27	2	Pin-Cotter
28	6	Nut-HF
29	6	Screw-HHF

Drum Brake / Pulley Assembly Removal (Gear Drive)

1. Raise the rear of machine so wheels are off the ground and support with jack stands.

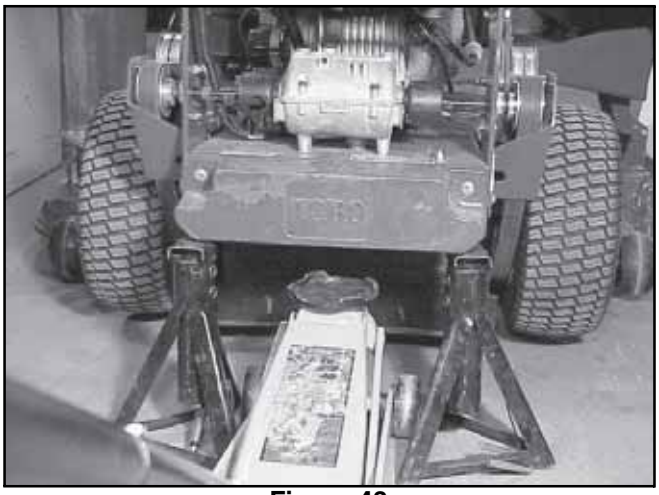


Figure 43 mvc-899

2. Remove the 4 wheel lug nuts from wheel hub.

Figure 44 mvc-900

3. Remove the rear wheel and tire from the wheel hub.

4. Remove belt from drum/pulley assembly.

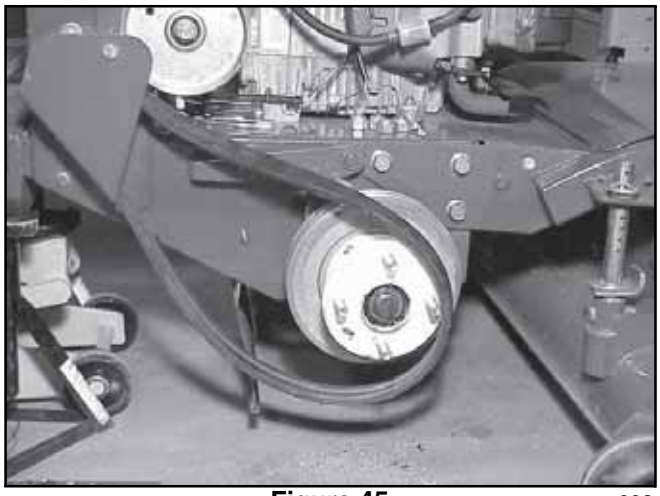


Figure 45 mvc-003

5. Remove the dust cap.

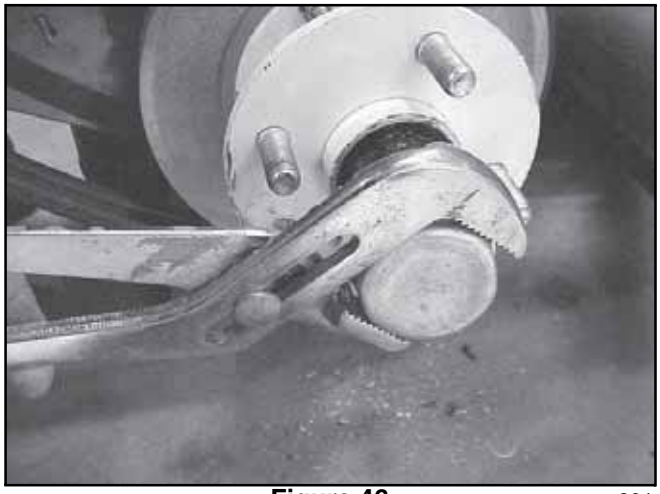


Figure 46 mvc-901

6. Remove cotter pin securing axle nut and discard cotter pin.

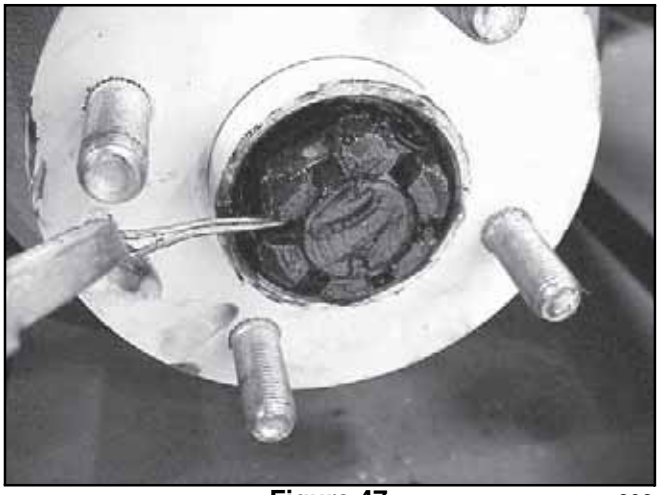


Figure 47 mvc-902

7. Remove the axle nut.

Figure 48 mvc-904

8. Remove the retaining ring holding the brake lever to chassis and discard.

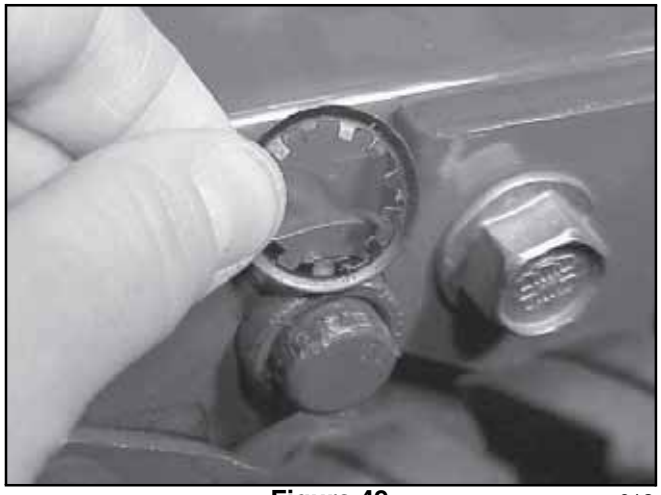


Figure 49 mvc-013

9. Remove hair pin holding brake rod to brake lever.

Figure 50 mvc-015

10. Disconnect brake rod from brake lever.

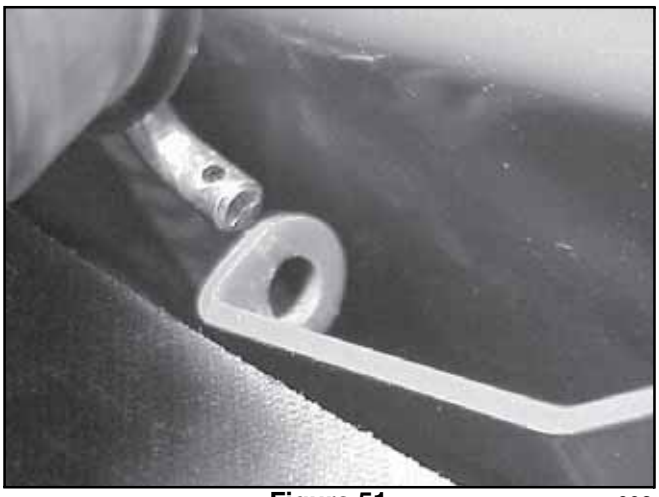


Figure 51 mvc-002

11. Remove hub, drum/pulley assembly with the brake band assembly from axle.

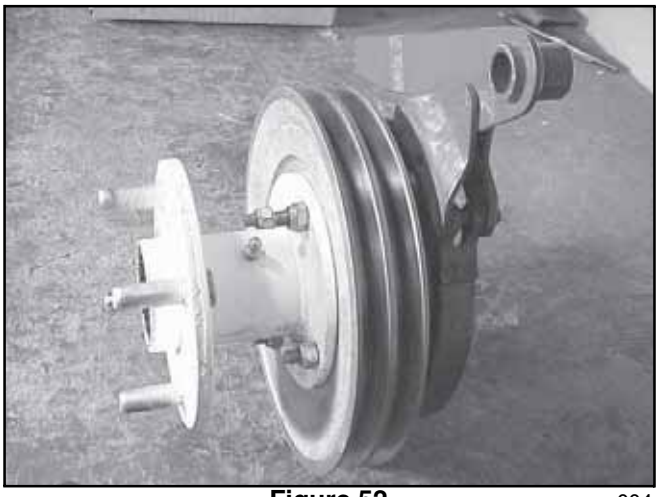


Figure 52 mvc-004

12. Slide brake band from drum and inspect for wear or damage. Replace if needed.

Figure 53 mvc-011

13. While using a 1/2" socket with extension to hold the bolt, use a 1/2" wrench and loosen lock nut and remove.

Figure 54 mvc-005

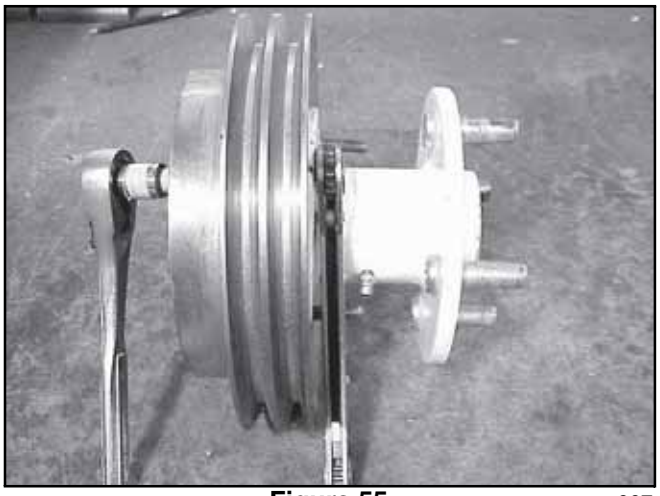


Figure 55 nvc-007

14. Separate drum/pulley assembly from wheel hub (Figure 56).

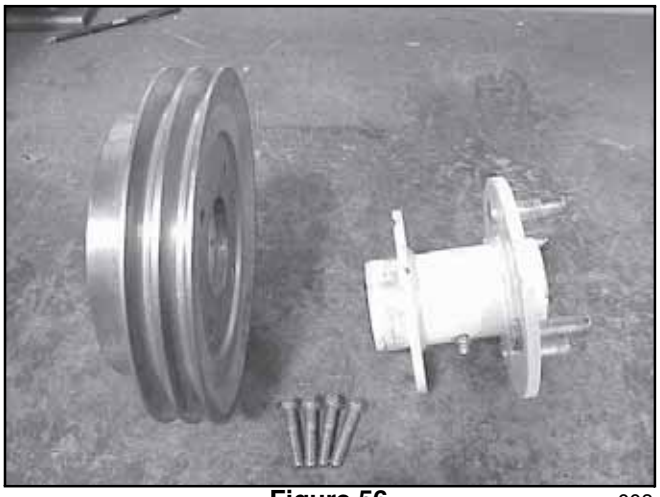


Figure 56 mvc-008

15. Inspect axle shaft, bearings and bearing races for wear, damage or dirt (Figure 57).

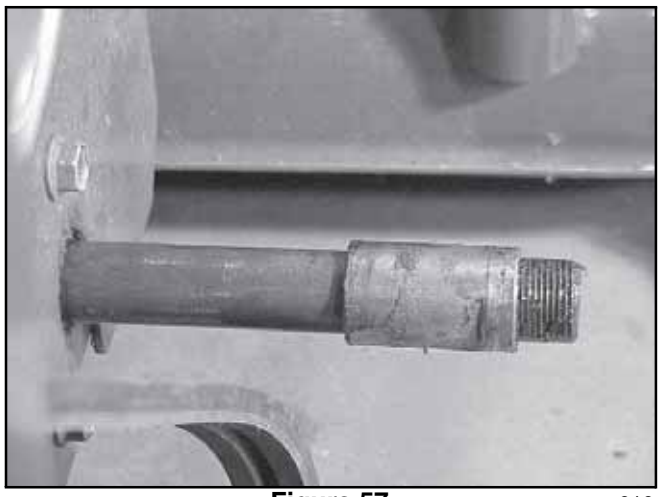


Figure 57 mvc-010

16. Reassemble brake drum/pulley assembly onto hub - torque nuts to 200 in. lbs. (22.6 N-m).

17. If you have the split pulley assembly - fasten the 2 split pulleys to the brake drum and fasten to wheel hub.

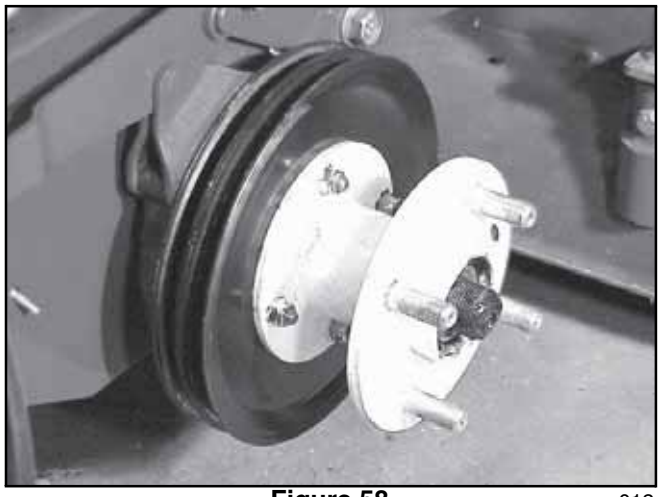


Figure 58 mvc-012

Note: Reassemble in reverse order.

18. Torque wheel lug nuts to 85 ft. lbs. (115 N-m).

Parking Brake Linkage (Pistol Grip Hydro)

Removal

1. Remove the hairpin cotter retaining the lower link to the brake shaft (Figure 59).

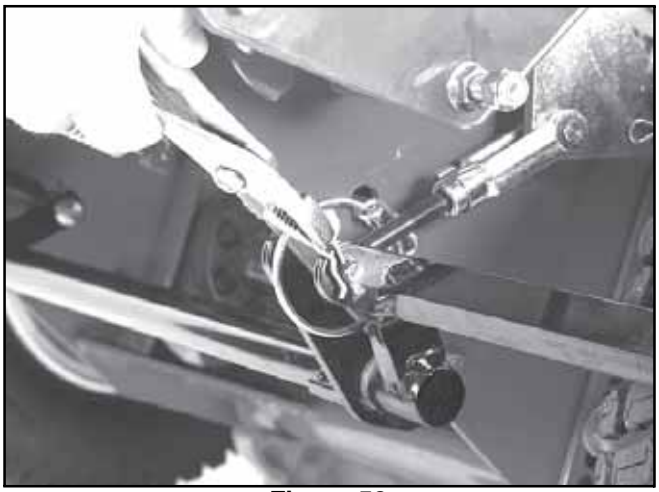


Figure 59 0602-36

2. To remove the idler spring, remove the nut and bolt assembly from the brake mounting flange end of the spring. Slip the opposite end of the spring off the brake return lever (Figure 60).

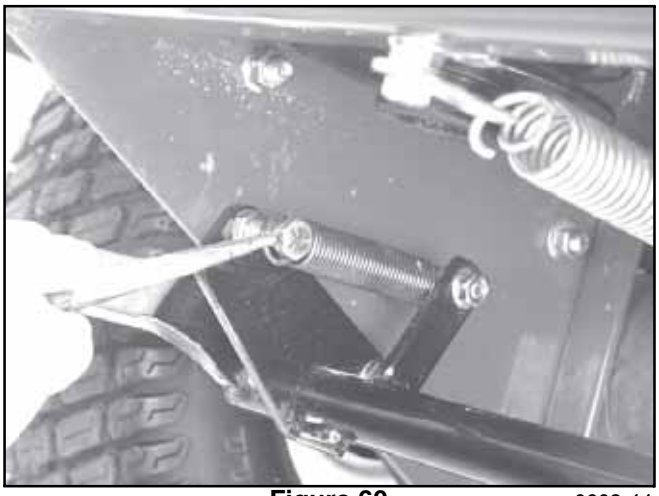


Figure 60 0602-44

3. Remove the remaining bolts securing the parking brake assembly to the rear frame.
4. Remove the bellcrank assembly.
5. Remove the hairpin clip from the upper linkage rod and remove the rod from the bellcrank (Figure 61).

Figure 61 0602-39

6. Remove the 2 bolts securing the bellcrank to the rear frame (Figure 62).

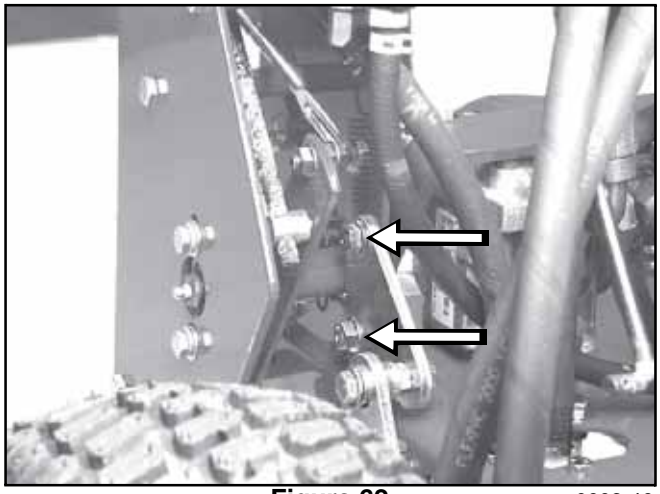


Figure 62 0602-46

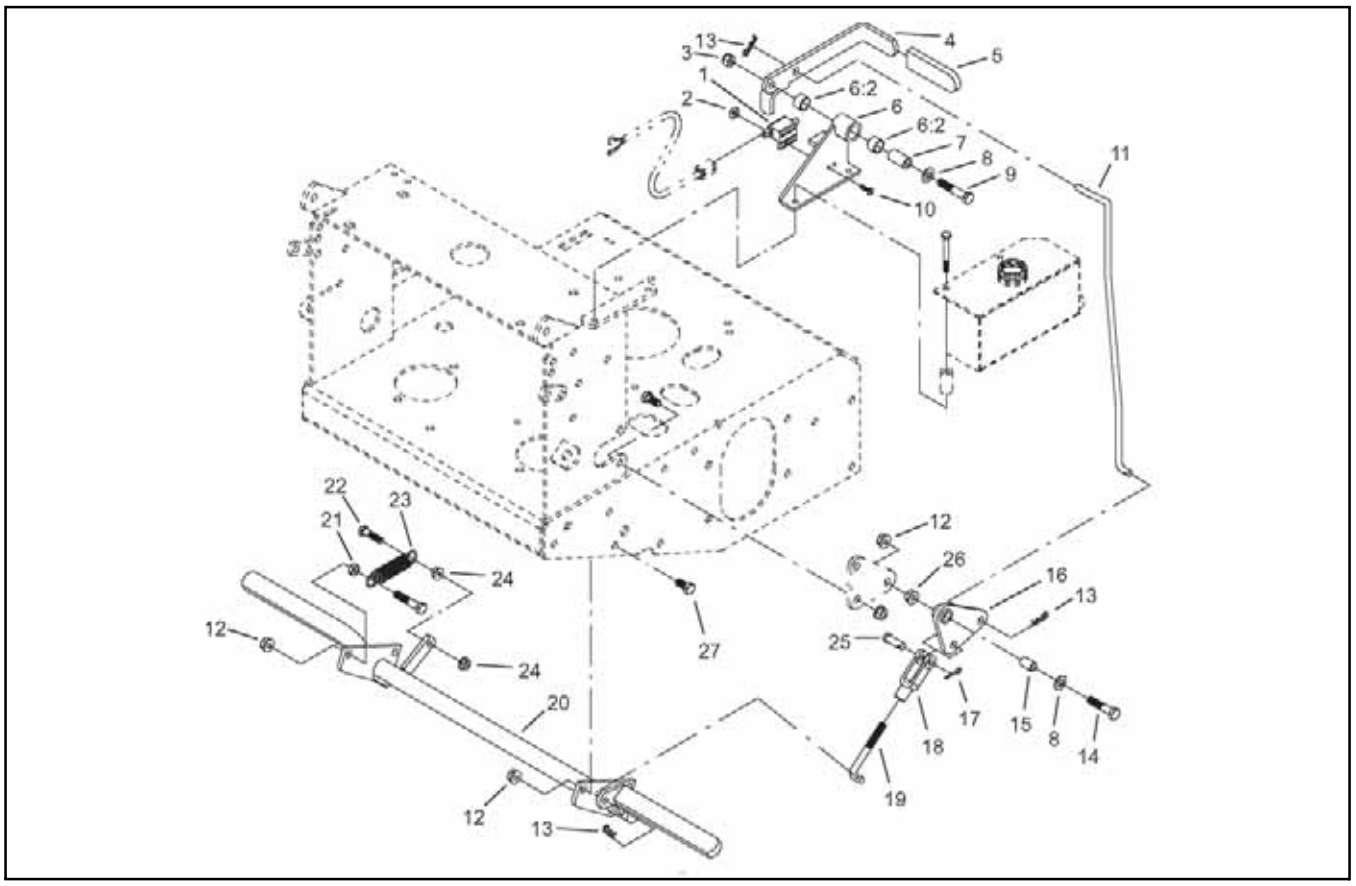
7. To remove the parking brake lever assembly, remove the pivot bolt and bushing from the lever bracket (Figure 63).

Figure 63 0602-37

Installation

Follow the removal procedures in reverse.

Linkage Assembly (Pistol Grip Hydro)



Ref. No.	Qty.	Description
1	1	Switch - Open, Normally
2	2	Nut - SQH
3	1	Nut - Lock, NI
4	1	Lever - Park Brake
5	1	Grip - Lever
6	1	Bracket ASM
6:2	2	Sleeve - Bushing
7	1	Bushing - Pivot
8	2	Washer - Flat
9	1	Screw - HH
10	2	Screw
11	1	Linkage - Upper
12	5	Nut - HHF
13	3	Pin - Hair

Ref. No.	Qty.	Description
14	2	Screw - HH
15	1	Bushing - Plastic
16	1	Bellcrank ASM
17	1	Pin - Cotter
18	1	Yoke - Linkage, Brake
19	1	Linkage - Lower
20	1	Brake
21	1	Nut - Jam
22	1	Screw - HH
23	1	Spring - Idler
24	2	Nut - Whizlock
25	1	Pin - Clevis
26	1	Nut - HF
27	3	Screw - HH

Fuel Tank Service

Draining The Fuel Tank

DANGER

In certain conditions, gasoline is extremely flammable and highly explosive. A fire or explosion from gasoline can burn you and others and can damage property.

- **Drain gasoline from the fuel tank when the engine is cold. Do this outdoors in an open area. Wipe up any gasoline that spills.**
- **Never smoke when draining gasoline, and stay away from an open flame or where a spark may ignite the gasoline fumes.**

1. Park the machine on a level surface, to assure fuel tank drains completely. Then disengage the power take off (PTO), set the parking brake, and turn the ignition key to “OFF” to stop the engine. Remove the key.

2. Close fuel shut-off valve at fuel tank.

Note: Remove fuel line from fuel valve that is closest to the engine.

3. Squeeze the ends of the hose clamp together and slide it up the fuel line away from valve.

4. Pull the fuel line off the valve. Open fuel shut-off valve and allow gasoline to drain into a gas can or drain pan.

Fuel Tank Removal

1. Place shutoff valve in the “off” position.

2. Disconnect the fuel line at the filter (Figure 64).

Figure 64 0602-06

3. Remove the 4 bolts securing the fuel tank to the frame.

Installation

Follow the removal procedures in reverse. **Note:** DO NOT overtighten the sprung mounting bolts (Figure 65).

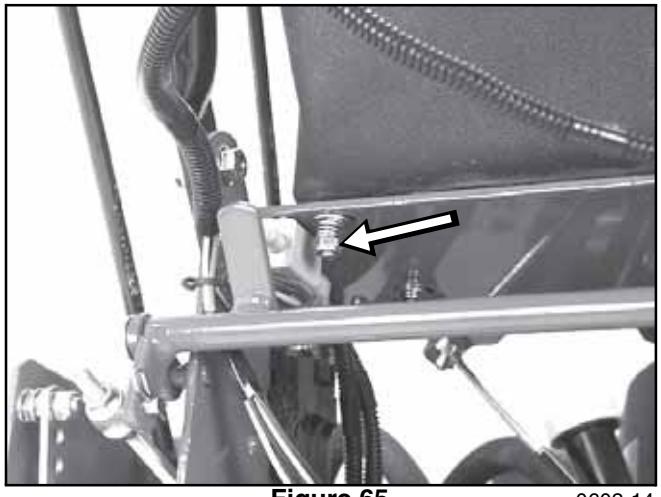


Figure 65 0602-14

Electric (PTO) Clutch (Floating Deck Models)

Removal

1. Stop the engine, remove the key, and disconnect the spark plug wires.
2. Raise the rear of the unit and place on safety stands.
3. Remove the deck covers.
4. Using a large channel lock pliers, move the idler pulley against spring tension until the PTO drive belt can be slipped off the idler pulley (Figure 66).

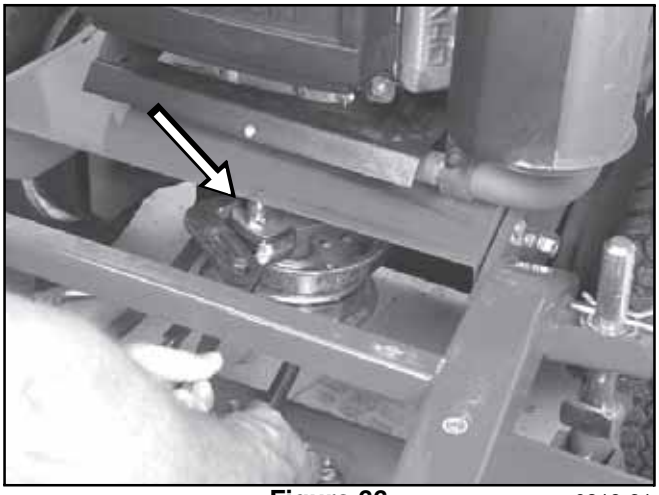


Figure 66 0819-21

5. Slip the PTO drive belt off the deck pulley and PTO clutch.
6. Disconnect the spring from the traction belt tensioning arm.
7. Separate the clutch wiring and push the clutch plug and grommet through the frame.
8. Remove the traction drive belt.
9. Remove the 2 rear engine mounting bolts and replace with 3” (76mm) long 5/16” bolts to maintain the engine to frame positioning.
10. Remove the 2 front engine mounting bolts and nuts.
11. Lift the engine and insert 3/4” (19mm) wooden blocks between the engine and frame (Figure 67). This will provide clearance between the axle and clutch pulley to permit removing the clutch from the crankshaft.

Figure 67 0820-04

12. Remove the nut, bolt, and spacer securing the clutch arm to the frame (Figure 68).

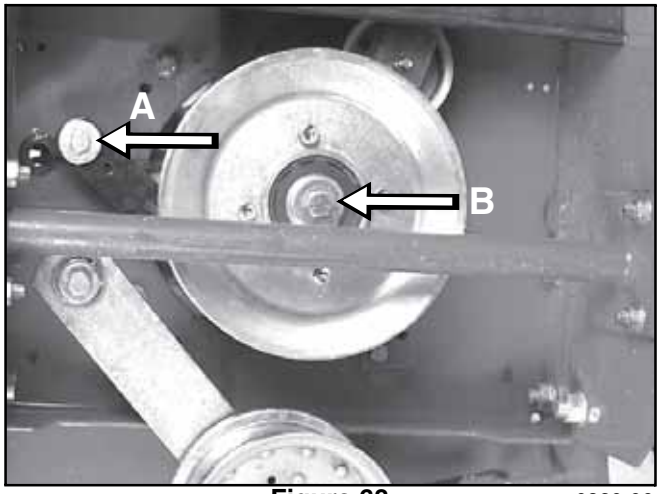


Figure 68 0820-06

(A) Clutch arm bolt	(B) Clutch retaining bolt

13. Remove the clutch retaining bolt and washer.
14. Slide the electric clutch off the crankshaft.

Installation

Follow the removal procedures in reverse. Apply anti-seize compound on the crankshaft to prevent rust.

Replacing the Drive Belt (Gear Drive - Floating Deck)

Service Interval/Specification

Check all belts after every 50 operating hours or monthly, whichever occurs first. Look for dirt, wear, cracks and signs of overheating.

1. Remove top capscrew securing idler support and idler bracket to rear frame (Figure 69).
2. Loosen bottom two mounting screws enough to allow belt to pass between drive pulley and idler support (Figure 69).
3. Raise wheel off ground enough to allow belt removal.

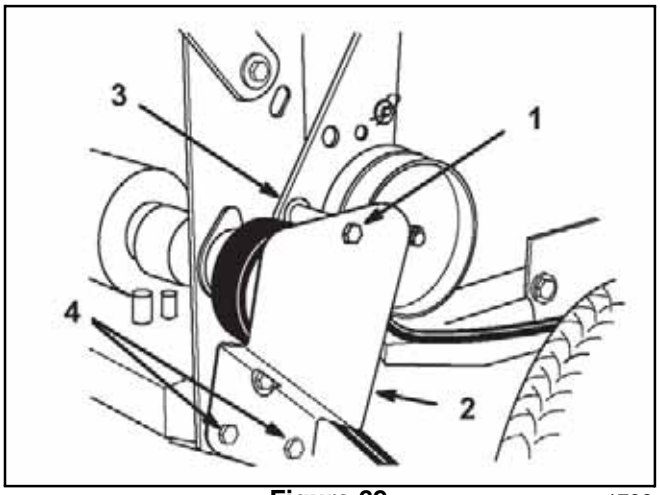


Figure 69 m-1722

(1) Top capscrew	(3) Idler support
(2) Idler bracket	(4) Bottom capscrew

Replacing the Drive Belt (Fixed Deck Pistol Grip)

Service Interval/Specification

Check all belts after every 50 operating hours or monthly, whichever occurs first. Look for dirt, wear, cracks, and signs of overheating.

1. Disengage the blade control (PTO) lever and set the parking brake.
2. Stop the engine and wait for all moving parts to stop.
3. Remove the drive spring from the adjustment bolt (Figure 70).

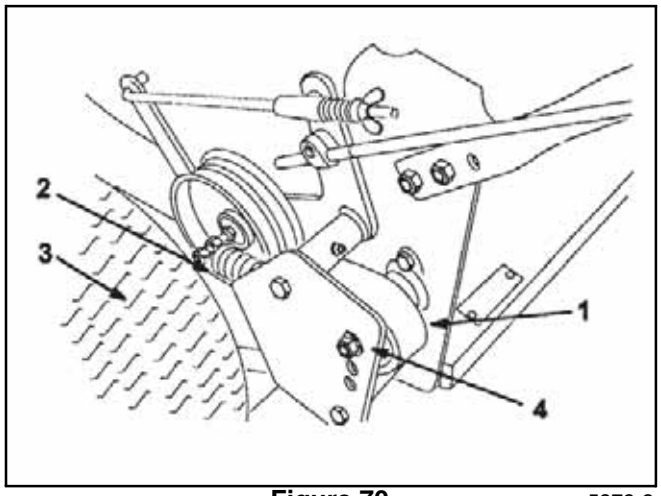


Figure 70 m-5372-2

(1) Drive belt	(3) Tire
(2) Drive spring	(4) Adjustment bolt

4. Remove the drive belt from the pulleys and over the tire.
5. Install the new belt and the drive spring.

Replacing the Traction Belt (Floating Deck)

1. Raise the front of the machine and support with jack stands.
2. Disconnect clutch wire connector from wire harness (Figure 71).
3. Remove PTO drive belt. Refer to ”Replacing the Drive Belt (Gear Drive - Floating Deck)" on page 4 - 21.
4. Remove clutch retainer from the engine deck (Figure 71).
5. Unhook tension spring from side of frame (Figure 71).
6. Loosen pivot bolt enough to remove traction belt from the drive pulley and clutch (Figure 71).
7. Install new belt around clutch and drive pulley.
8. Torque pivot bolt to 35 - 40 ft. lb. (47 - 54 N•m). Install tension spring between idler arm and frame bracket (Figure 71).
9. Install clutch retainer to the engine deck (Figure 71).
10. Connect clutch wire connector to wire harness.
11. Install PTO drive belt.

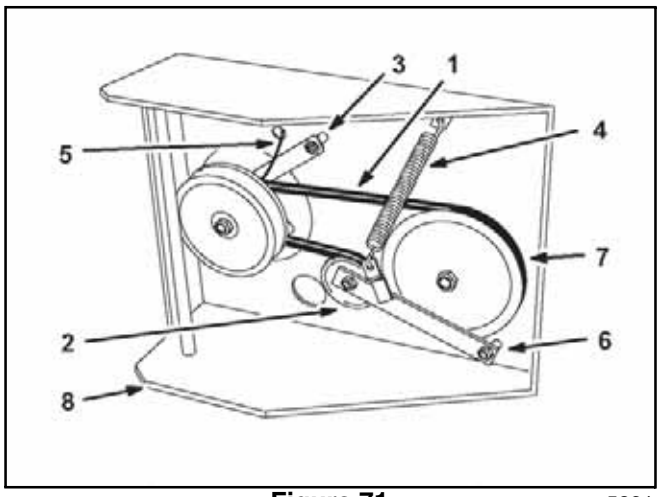


Figure 71 m-5321

(1) Traction belt	(5) Clutch wire connector
(2) Idler pulley	(6) Pivot bolt
(3) Clutch retainer	(7) Drive pulley
(4) Tension spring	(8) Engine deck

Replacing the Traction Belt (Fixed Deck)

1. Disengage the blade control (PTO) lever and set the parking brake.
2. Stop the engine and wait for all moving parts to stop before leaving the operating position.
3. Raise the rear of the machine and hold it up with jack stands.

4. Remove the mower belt (Figure 72).

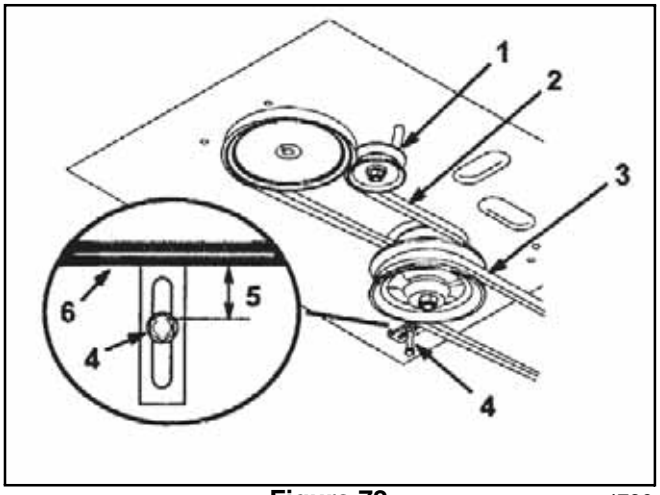


Figure 72 m-4726

(1) Idler pulley in slot	(4) Belt guide
(2) Traction belt	(5) 1-1/4 in. (32mm)
(3) Mower belt	(6) Mower belt

5. Loosen the mounting bolt enough to slide the idler pulley in the slot and remove the traction belt from the engine and drive pulleys (Figure 72).

6. Install the new traction belt around the engine and the drive pulleys (Figure 72).

7. Slide the idler pulley in the engine frame to tension the traction belt and tighten mounting bolt (Figure 72).

8. Install the mower belt (Figure 72).

9. Check the belt guide under the engine frame for the proper adjustment (Figure 72).

Note: The distance between the belt guide and mower belt should be 1-1/4 in. (32mm) when the mower belt is engaged. Adjust the belt if necessary. The disengaged belt should not drag or fall off the pulley when the guides are properly adjusted.

Adjusting Grass/Mud Scraper

1. Loosen the locknut holding scraper to the engine frame (Figure 73).

2. Rotate scraper until aligned with center of pulley grooves (Figure 73).

3. Tighten the locknut (Figure 73).

Note: The scraper must not contact the pulley on the sides or bottom of grooves. Re-adjust if necessary.

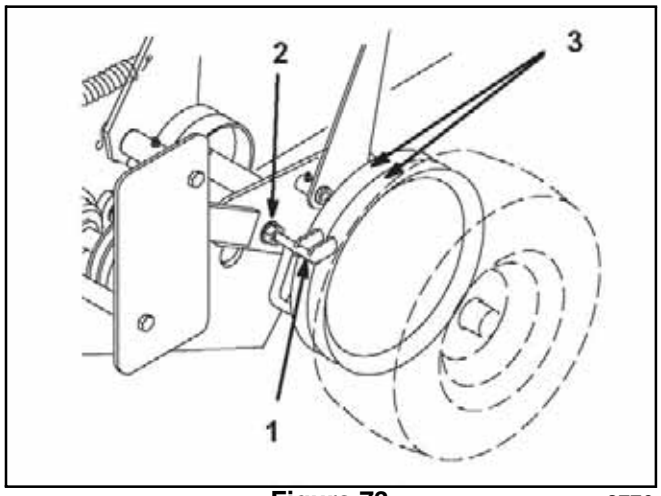


Figure 73 m-3776

(1) Scraper	(3) Pulley
(2) Locknut	

THIS PAGE INTENTIONALLY LEFT BLANK

Hydraulic Drive System Overview

The hydrostatic drive system consists of two bi-directional high-pressure loops, one for each drive wheel. Each loop is made up of a pump, motor, and the high-pressure hoses connecting them together. Both high-pressure loops share a common low-pressure supply system. The components of the low-pressure supply system are the reservoir, filter, and low-pressure hoses.

The pump is driven by an internal combustion engine through a belt and pulley system.

The speed and direction of each drive wheel is controlled independently by varying the output of the pump. The output of the pump is varied by moving the speed control handle and drive lever.

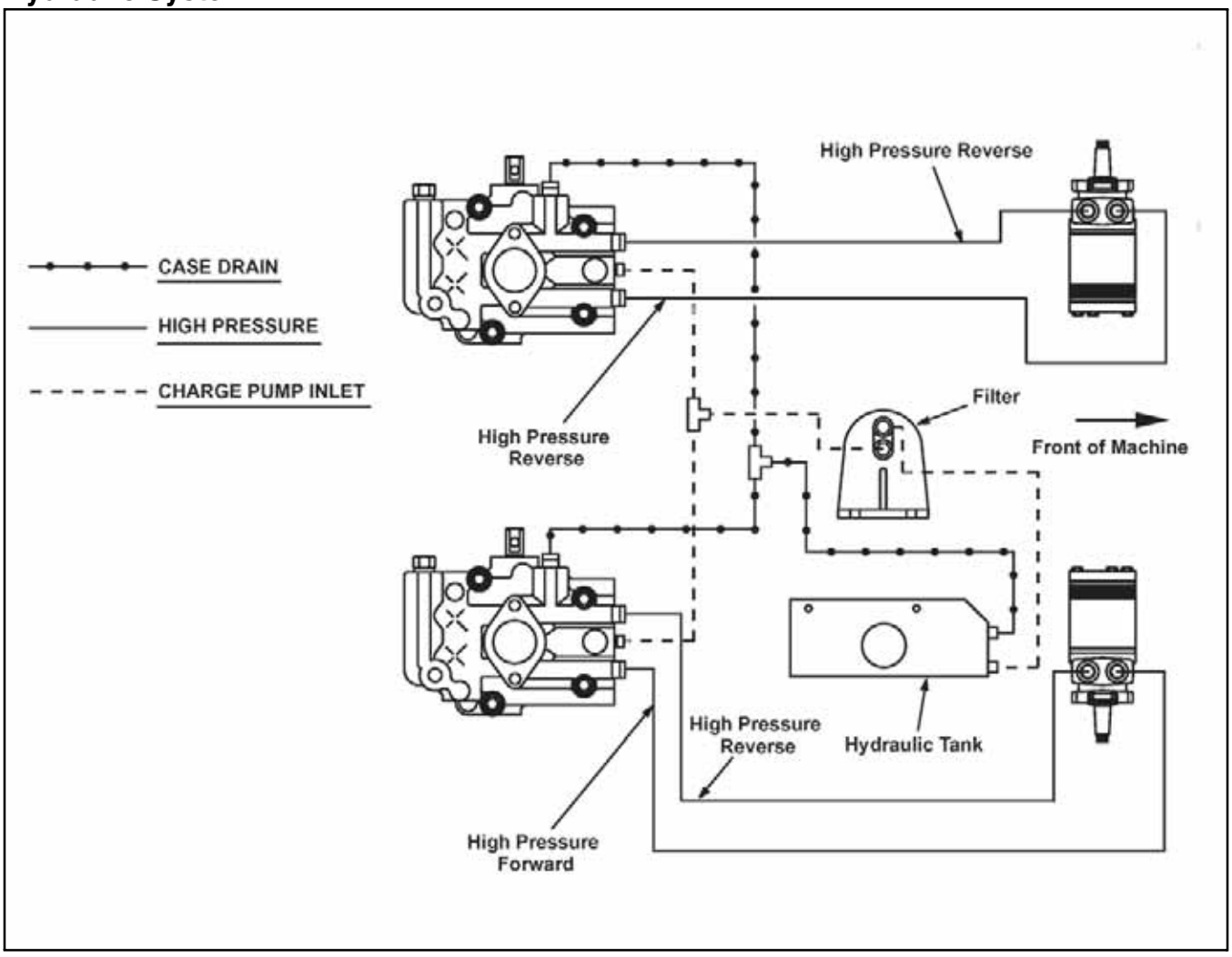
The charge pump portion of the pump circulates fluid through the low-pressure system.

Oil is drawn through each pump's case drain line to the reservoir for cooling, then through the filter for cleaning and finally pumped back into the high pressure loop by the charge pump.

On fixed deck models only, a cold start ring is used, which when engaged, removes tension from the pump drive belt. This reduces the effort required to pull the recoil starter when in cold temperatures.

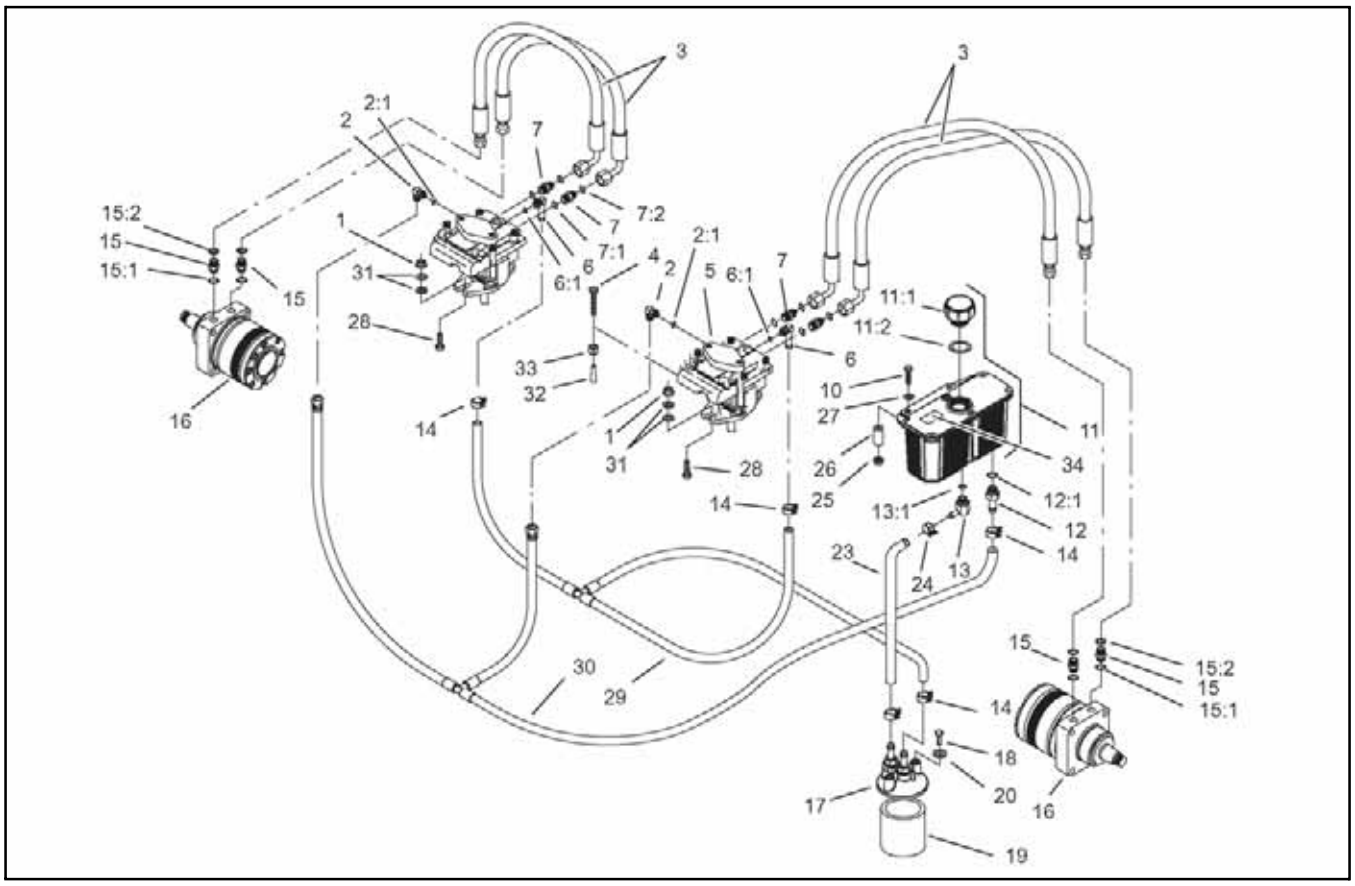
More detailed information about each component can be found on the Toro Hydraulic Troubleshooting CD (PN# 492-4777), Ross Wheel Motor Service and Repair Manual (492-4753), and the Hydro-Gear Service and Repair Manual, PN# 492-4749.

Hydraulic System



HYDRAULIC DRIVE SYSTEMS

Hydraulic Drive System Assembly



Ref. No.	Qty.	Description
1	4	Nut - HHF
2	2	Fitting - 90°
2:1	1	“O” Ring
3	4	Hose - Pressure, High
4	2	Screw
5	2	Pump
6	2	Fitting
6:1	1	“O” Ring
7	4	Fitting - Straight
7:1	1	“O” Ring
7:2	1	“O” Ring
10	2	Screw - HH
11	1	Reservoir - HYD
11:1	1	Cap - Reservoir, HYD
11:2	1	Gasket - Cap
12	1	Adapter - Straight
12:1	1	“O” Ring
13	1	Elbow - 45°
13:1	1	“O” Ring
14	4	Clamp - Hose

Ref. No.	Qty.	Description
15	4	Fitting - Straight
15:1	1	“O” Ring
15:2	1	“O” Ring
16	2	Motor - Wheel
17	1	Filter Head ASM
18	2	Screw - HH
19	1	Filter - HYD
20	2	Washer - Lock
23	1	Hose - Charge
24	1	Clamp - Hose
25	2	Nut - HF
26	2	Spacer
27	2	Washer - Flat
28	4	Screw - HH
29	1	HYD Hose ASM
30	1	HYD Hose ASM
31	8	Washer - Flat
32	2	Grip - Valve, Dump
33	2	Nut - Lock, NI
34	1	Decal - Tank, HYD

Servicing the Hydraulic System

Replacing the Hydraulic Filter

Change the hydraulic filter:

- After the first 8 operating hours.
- After every 200 operating hours.

1. Disengage the PTO, turn the ignition key to off, and remove the key.
2. Wait for all moving parts to stop before leaving the operating position and then chock or block tires.

Important Do not substitute an automotive oil filter or severe hydraulic system damage may result.

3. Remove hydraulic reservoir cap and temporarily cover opening with a plastic bag and rubber band to prevent all hydro fluid from draining out.
4. Locate filter under engine base and place drain pan under filter (Figure 74).
5. Remove the old filter and wipe the filter adapter gasket surface clean (Figure 74).

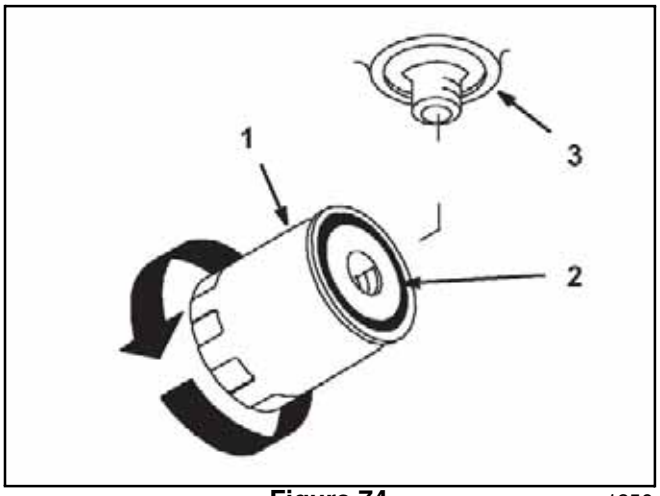


Figure 74 m-1256

(1) Hydraulic filter (2) Gasket	(3) Adapter

6. Apply a thin coat of hydro fluid to the rubber gasket on the replacement filter.
7. Install replacement hydraulic filter onto the filter adapter. Do not tighten.
8. Remove plastic bag from reservoir opening and allow filter to fill with hydro fluid.
9. When fluid overflows filter, turn the oil filter clockwise until the rubber gasket contacts the filter adapter. Then tighten the filter an additional 1/2 turn (Figure 74*).*
10. Clean up any spilled fluid.
11. Add Mobil 1 15W-50 synthetic motor oil or equivalent synthetic oil to approximately 1/4 in. (6mm) below the top of reservoir baffle.

Important Use oil specified or equivalent. Other fluids could cause system damage.

12. Start engine and let run for about two minutes to purge air from the system. Stop the engine and check for leaks. If one or both wheels will not drive, refer to "Bleeding Hydraulic System (Floating Deck Models)" on page 5 - 4.
13. Recheck level and add fluid, if required. Do not overfill.

Checking the Hydraulic Fluid

Check the hydraulic fluid level:

- Before engine is first started.
- After first 8 operating hours.
- After 40 operating hours.

Fluid Type: Mobil 1 15W-50 synthetic motor oil or equivalent synthetic oil.

Important Use oil specified or equivalent. Other fluids could cause system damage.

Hydraulic System Oil Capacity: 67 oz. (2.0 l).

1. Position machine on a level surface, stop the engine and chock or block tires.

2. Clean area around filler neck of hydraulic tank (Figure 75).

3. Remove cap from filler neck. Look inside to check if there is fluid in the reservoir. (Figure 75).

4. If there is no fluid, add fluid to reservoir approximately a 1/4 in. (6mm) below the top of baffle.

5. Run the machine 15 minutes to allow any air to purge out of the system and warm fluid.

6. Recheck level while fluid is warm. Add fluid to raise level to top of the baffle, if required.

Note: Fluid level should be to the top of the baffle when fluid is warm (Figure 75).

7. Install cap on filler neck.

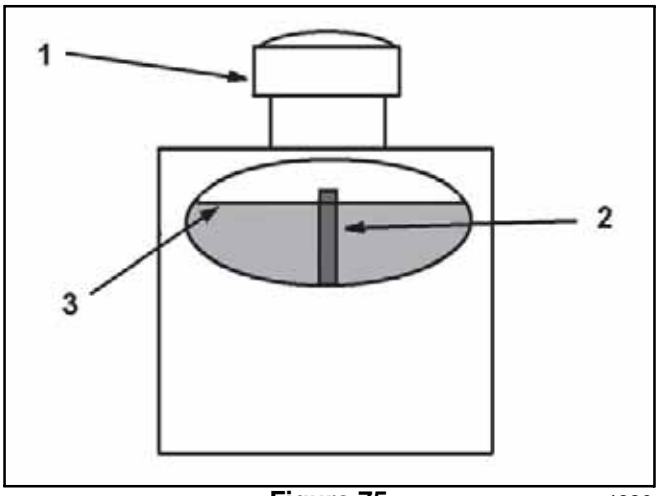


Figure 75 m-4280

(1) Cap (2) Baffle	(3) Fluid level - full

WARNING

Hydraulic fluid escaping under pressure can penetrate skin and cause injury.

- **If hydraulic fluid is injected into the skin it must be surgically removed within a few hours by a doctor familiar with this type of injury. Gangrene may result if this is not done.**
- **Keep body and hands away from pin hole leaks or nozzles that eject high pressure hydraulic fluid.**
- **Use cardboard or paper to find hydraulic leaks.**
- **Safely relieve all pressure in the hydraulic system before performing any work on the hydraulic system.**
- **Make sure all hydraulic fluid hoses and lines are in good condition and all hydraulic connections and fittings are tight before applying pressure to hydraulic system.**

Bleeding Hydraulic System (Floating Deck Models)

The traction system is self bleeding, however, it may be necessary to bleed the system if fluid is changed or after work is performed on the system.

1. Raise rear of the machine so wheels are off the ground and support with jack stands.

2. Start the engine and run at idle speed. Engage traction on one side and spin the wheel by hand.

3. When the wheel begins to spin on its own, keep it engaged until wheel drives smoothly (minimum 2 minutes).

4. Check hydraulic fluid level as it drops and add as required to maintain proper level.

5. Repeat procedure on opposite wheel.

Bleeding Hydraulic System (Fixed Deck Models)

The traction system is self-bleeding, however, it may be necessary to bleed the system if fluid is changed or after work is performed on the system.

Air must be purged from the hydraulic system when any hydraulic components, including oil filter, are removed or any of the hydraulic lines are disconnected. The critical area for purging air from the hydraulic system is between the oil reservoir and each charge pump located on the top of each variable displacement pump. Air in other parts of the hydraulic system will be purged through normal operation once the charge pump is “primed”.

1. Disengage the PTO, turn the ignition key to off, and remove the key. Wait for all moving parts to stop before leaving the operating position.

2. Raise the rear of machine so wheels are off the ground and support with jack stands.

3. Check hydraulic fluid level.

4. Start engine and move throttle control to full throttle position. Move the speed control lever to the middle speed position and place the drive levers into the “drive” position.

If either drive wheel does not rotate, it is possible to assist the purging of the charge pump by carefully rotating the tire in the forward direction.

Note: It is necessary to lightly touch the charge pump cap (Figure 76) with your hand to check the pump temperature. If the cap is too hot to touch, turn off engine. The pumps may be damaged if the pump becomes too hot. If either drive wheel still does not rotate, continue to next step.

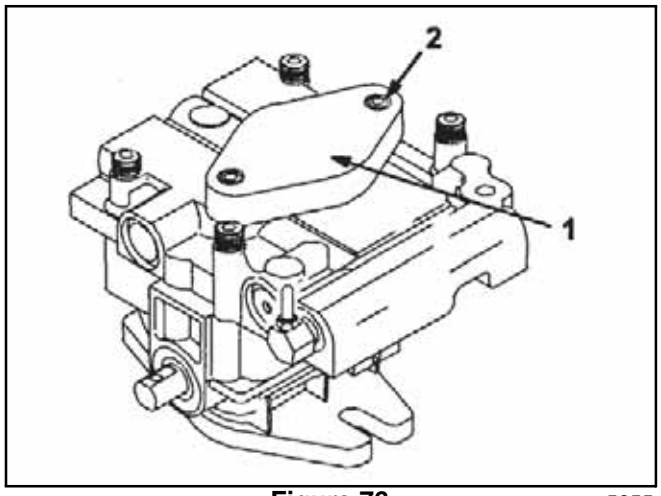


Figure 76 m-5955

(1) Charge pump cap	(2) Socket head screw

5. Thoroughly clean the area around each of the charge pump housings.

6. To “prime” charge pump, loosen two hex socket head capscrews (Figure 76) 1-1/2 turns only. Make sure engine is not running. Lift charge pump housing upward and wait for a steady flow of oil to flow out from under housing. Retighten capscrews. Do this for both pumps.

Note: Hydraulic reservoir can be pressurized to up to 5 psi to speed this process.

7. If either drive wheel still does not rotate, stop and repeat steps 4, 5, and 6 on the respective pump. If wheels rotate slowly, the system may prime after additional running. Recheck hydraulic fluid level.

8. Allow unit to run several minutes after the charge pumps are “primed” with drive system in the full speed position.

9. Check hydro control linkage adjustment. Refer to "Hydro Control Linkage Adjustment (Pistol Grip Floating Deck)" on page 5 - 12.

By-Pass Valve (T-Bar)

The by-pass valve is adjustable to ensure easy operation with a variety of deck sizes. If the front of the deck lifts off the ground when the upper control bar is quickly pushed forward or the machine is unable to drive up hills, an adjustment may be needed.

Test Procedure

1. Start engine and run for 5 minutes at 3/4 throttle, to warm hydraulic fluid.

2. Drive the machine to a clear and level open area such as a driveway.

Important There should be at least 10 feet of clear area in front of the machine.

3. Loosen the quick release levers and push the reference bar forward to the “FAST” position. Lock the quick release levers to secure the reference bar.

4. Move throttle control to 3/4 throttle.

5. Quickly push the upper control bar against the reference bar. The front caster wheels should almost lift off the ground. If front caster wheels lift the off the ground, the machine is too aggressive and adjustment is required.

6. Move the engine throttle to the “FAST” position.

7. Quickly push the upper control bar against the reference bar. The front caster wheels should lift approximately 1 inch (25mm) off the ground. If front caster wheels lift the off the ground more than 2 inches (50mm), the machine is too aggressive. Adjustment is required.

8. If the machine accelerates slowly, and the front caster wheels do not lift off the ground, the machine is too un-responsive. Adjustment is required.

Adjustment Procedure

The by-pass valve should be adjusted to deliver best performance for the size (weight) mower you have. The by-pass valve factory setting is 1/2 turn out.

The following values can be used as initial settings for different size mowers:

52 in. (132cm)	1/2 turn out
44 in. (112cm)	1 turn out
36 in. (91cm)	1-1/6 turn out

1. Loosen large jam nut several turns (Figure 77).

2. Gently close by-pass valve (Figure 77).

Important Do not over-tighten valve or needle and seat may be damaged. Do not exceed 50 inch pounds (6 N-m) to close valve.

3. Open by-pass valve 1/2 turn (Figure 77).

4. Tighten jam nut to lock the adjustment (Figure 77).

5. Repeat “Test Procedure” to check for proper operation.

Important By-pass valve adjustment is very sensitive, do not adjust more than 1/6 turn (one flat) at a time.

6. If the machine is too aggressive or tends to jump forward, the valve needs to be opened further.

7. If the machine is slow to respond, the valve needs to be closed further.

8. Repeat “Test Procedure” to check for proper operation. Re-adjust the by-pass valves until proper performance is achieved.

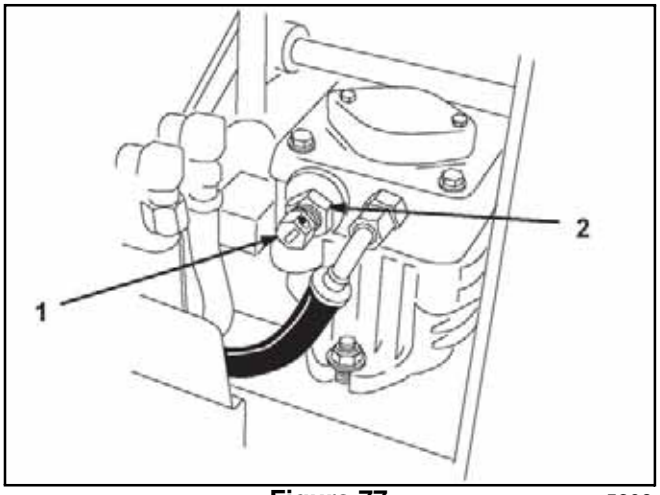


Figure 77 m-5209

(1) By-pass valve	(2) Jam nut

Neutral Adjustment (T-Bar Floating Deck)

If wheels turn when control bar is in neutral, adjustment is required.

1. Raise rear of the machine so wheels are off the ground and support with jack stands.

CAUTION

Children or bystanders may be injured if they move or attempt to operate the machine while it is unattended.

Always remove the Ignition and chock or block tires when leaving the machine unattended, even if just for a few minutes.

2. Start engine and run for 5 minutes at 3/4 throttle, to warm hydraulic fluid.

3. Move control bar rearward and forward then release. If wheels rotate when control bar is in neutral, adjustment is required.

4. Loosen top and bottom jam nuts at pump arm neutral adjustment sleeve (Figure 78).

5. Push down on pump arm until sleeve contacts bottom nut (Figure 78). Wheel should now be rotating slowly in reverse.

6. Turn bottom nut up slowly, moving sleeve and pump arm up, until wheel stops rotating (Figure 78).

7. Turn top nut down against sleeve and tighten to lock the adjustment (Figure 78).

8. Repeat step 3 above to check adjustment. Repeat adjustment procedure if necessary.

9. Repeat on other wheel, if necessary.

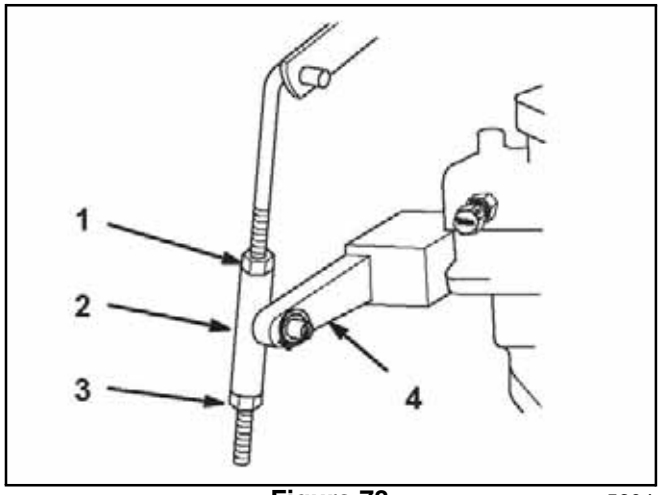


Figure 78 m-5204

(1) Top jam nut (2) Sleeve	(3) Bottom jam nut (4) Pump arm

Handle and Control Rods (T-Bar Floating Deck)

1. Align upper handle with upper mounting holes in rear frame (Figure 79).

2. Secure each upper mounting hole with a flange bolt (3/8 x 1 in. (26mm) and flange nut (Figure 79). Torque bolts to 25 ft. lbs. (34 N-m).

3. Select high, medium or low position for the lower mounting hole (Figure 79). This allows the upper handle to be adjusted to the user's height preference.

4. Secure each lower mounting hole with a flange bolt (3/8 x 1 in. (26mm) and flange nut (Figure 79). Torque bolts to 25 ft. lbs. (34 N-m).

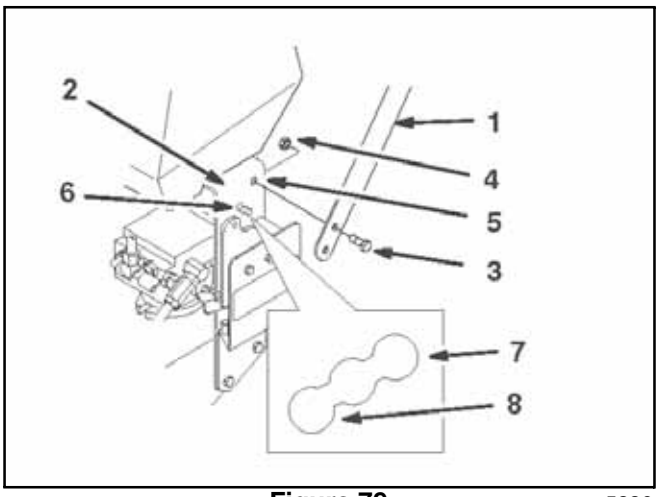


Figure 79 m-5336

(1) Upper handle	(5) Upper mounting hole
(2) Rear frame	(6) Lower mounting hole
(3) Flange bolt, 3/8 x 1 in. (26mm)	(7) Low position
(4) Flange nut, 3/8 in.	(8) High position

Install Control Rods

Before installing and adjusting control rods, loosen quick release levers and move reference control bar all the way forward.

Left Control Rod

1. Slide clevis pin through rod fitting and mounting hole in control bracket (from outside). Secure with washer and hairpin cotter (Figure 81).

2. Remove hairpin cotter and rod from upper control bars (Figure 80).

3. Press and hold upper control bars against reference bar, so stop hits (Figure 80).

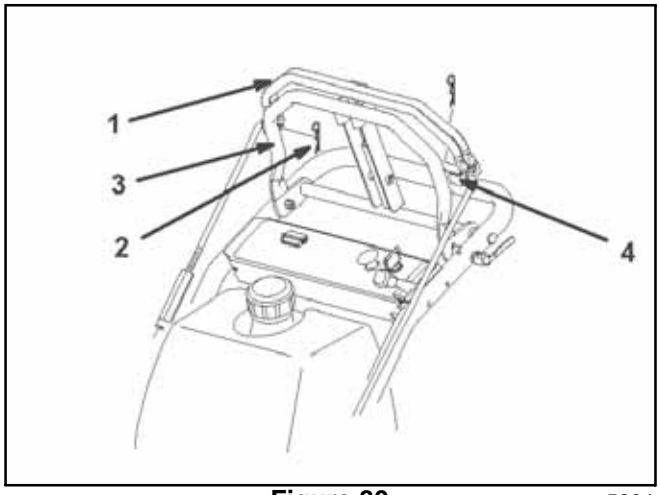


Figure 80 m-5264

(1) Upper control bars	(3) Reference bar
(2) Hairpin cotter	(4) Stop

4. Push rod full forward until bearing is against control bracket stop. Thread rod in or out of fitting on control bracket until rod aligns with holes in upper control bars (Figure 81).

5. When rod and holes in upper control bars line up, turn rod one additional turn, so rod is shorter.

Note: Upper control bar stop must hit reference bar before roller bearing hits control bracket stop.

6. Connect rod to upper control bars with previously removed hairpin cotter (Figure 80).

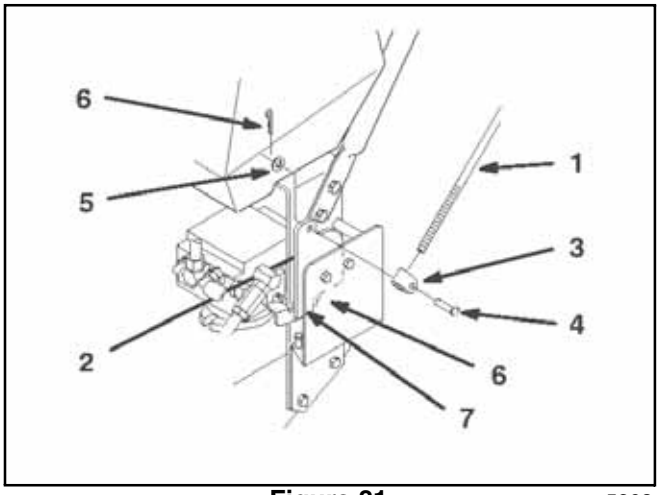


Figure 81 m-5263

(1) Control rod-left	(5) Washer
(2) Control bracket	(6) Hairpin cotter
(3) Rod fitting	(7) Control bracket stop
(4) Clevis pin	(8) Roller bearing

Right Control Rod

1. Slide rod into control bracket and secure with hairpin cotter (Figure 82).

2. Remove hairpin cotter and rod from upper control bars (Figure 80).

3. Press and hold upper control bars against reference bar, so stop hits (Figure 80).

4. Push rod full forward until bearing is against control bracket stop. Loosen wing nut and thread turnbuckle in or out until rod aligns with holes in upper control bars (Figure 82).

5. When rod and holes in upper control bars line up, rotate turnbuckle one additional turn, so rod is shorter.

Note: Upper control bar stop must hit reference bar before roller bearing hits control bracket stop.

6. Connect rod to upper control bars with previously removed hairpin cotter, tighten wing nut and turnbuckle (Figure 80).

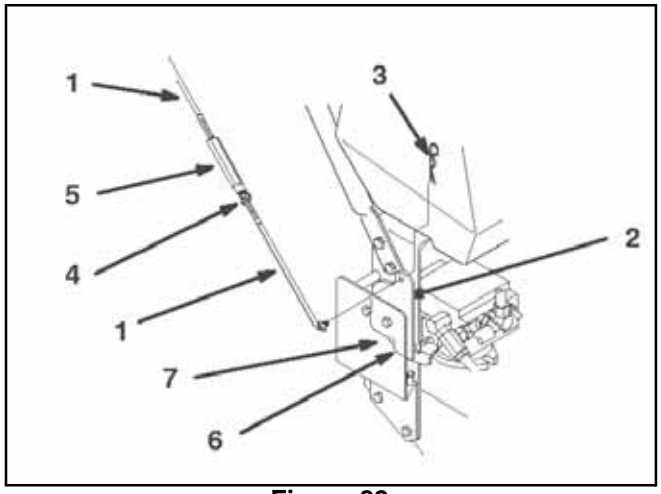


Figure 82 m-5262

(1) Control rod-right	(5) Turnbuckle
(2) Control bracket	(6) Control bracket stop
(3) Hairpin cotter	(7) Roller bearing
(4) Wing nut	

Adjust Tracking

1. After completing assembly, check machine tracking. Operate machine by holding upper control bar against reference bar with wheel drive engaged.

2. If machine does not track straight, moves more right or left, adjustment is required.

3. Loosen wing nut on right control rod and rotate turnbuckle in or out to change tracking. Secure turnbuckle in position with wing nut (Figure 82).

4. Check for proper tracking.

Note: Control rods must be adjusted if handle height position is changed.

Hydro Linkage Adjustments (Pistol Grip Floating Deck)

Perform the following linkage adjustments when the machine needs maintenance. If adjustment is needed, do them in the order that they are listed.

- Adjust speed control linkage.
- Adjust neutral control linkage.
- Adjust hydro control linkage.
- Adjust control rods.
- Tracking adjustment.

Speed Control Linkage (Pistol Grip Floating Deck)

1. Stop engine and wait for all moving parts to stop.
2. Move the speed control lever (located on the console) to the full forward position.
3. Check the orientation of the tabs on the ends of the speed control crank. These tabs should be pointing straight down at the 6 o'clock position approximately (Figure 83).
4. Adjust the threaded yoke at the bottom of the speed control linkage until the tabs are at the 6 o'clock position (Figure 83).

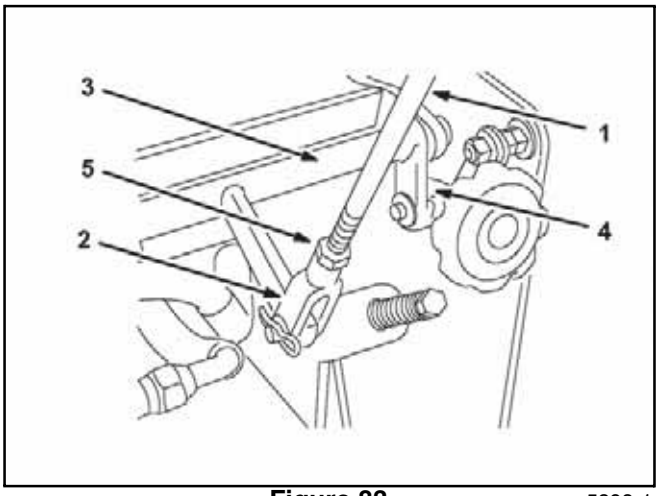


Figure 83 m-5398-1

(1) Speed control rod	(4) Tabs, 6 o'clock position
(2) Yoke	(5) Jam nut
(3) Speed control crank	

5. Pull the speed control lever back to neutral.
6. Check to make sure the safety switch is depressed and there is a 5/16 in. (8mm) space between the actuating tab and the switch. (Figure 84).
7. If needed, adjust switch location to create the 5/16 in. (8mm) space (Figure 84).

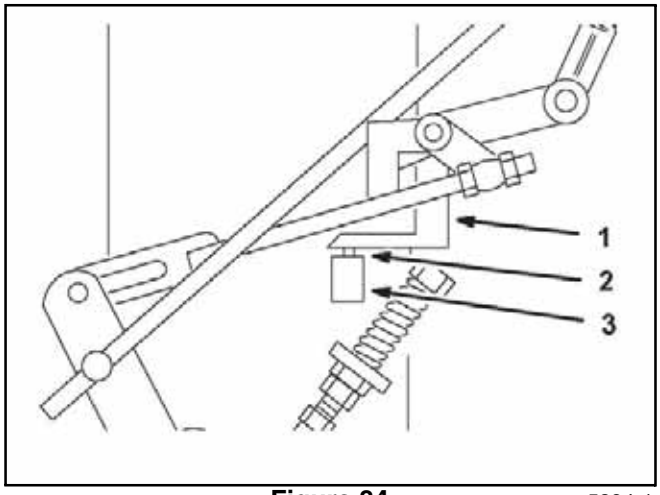


Figure 84 m-5394-1

(1) Actuating tab	(3) Safety switch
(2) 5/16 in (8mm) space	

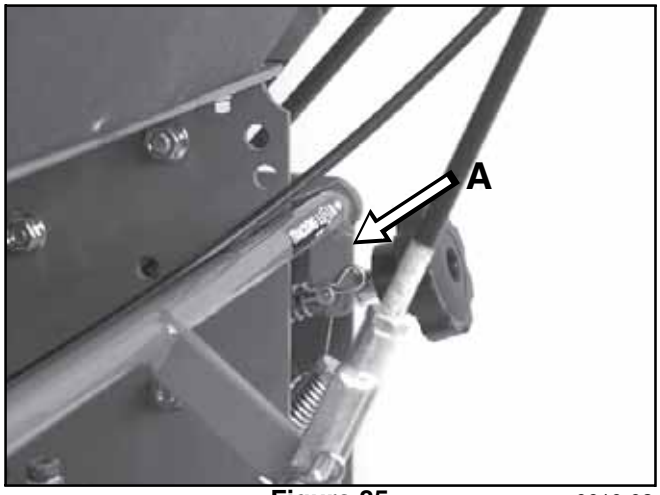


Figure 85 0610-03

(A) Tab at 6 o'clock

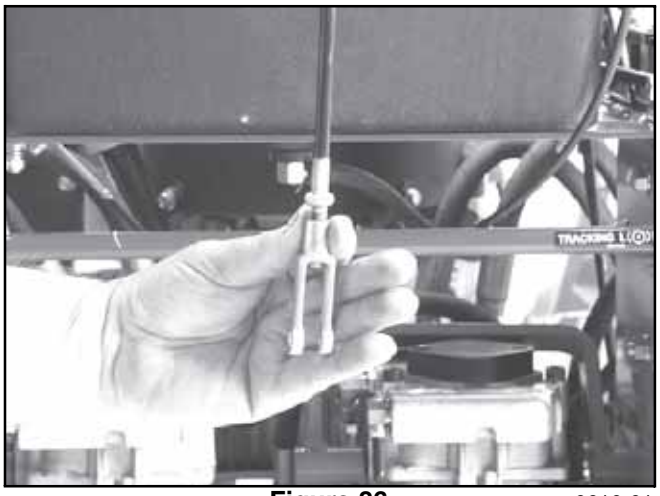


Figure 86 0610-01

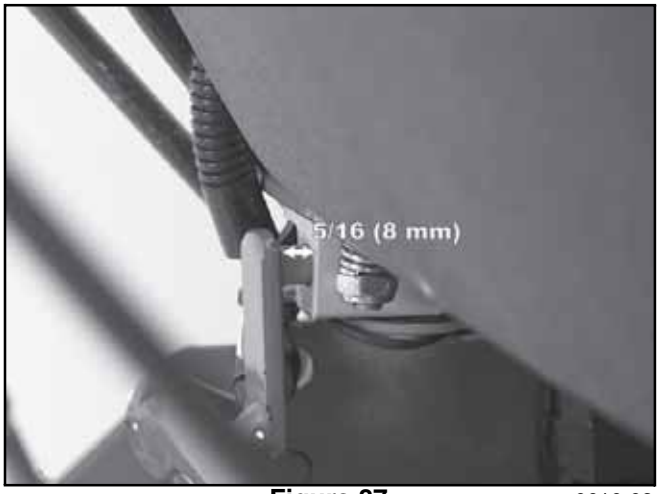


Figure 87 0610-02

Important Perform the following linkage adjustments in the order that they are listed.

Neutral Control Linkage Adjustment (Pistol Grip Floating Deck)

WARNING

Engine must be running so control linkage adjustments can be performed. Contact with moving parts or hot surfaces may cause personal injury.

Keep hands, feet, face, clothing and other body parts away from rotating parts, muffler and other hot surfaces.

WARNING

Mechanical or hydraulic jacks may fail to support machine and cause a serious injury.

- **Use jack stand when supporting machine.**
- **Do not use hydraulic jacks.**

1. Raise the rear of the machine onto jack stands to raise the drive wheels off the ground.

2. Start the engine and move the throttle to the full throttle position.

3. Place the neutral locks in the full forward position and move the speed control lever to the medium speed position.

4. Hold OPC levers down.

Note: The OPC levers must be held down whenever the speed control lever is out of the neutral position or the engine will kill.

WARNING

Electrical system will not perform proper safety shut off with Operator Presence Control (OPC) levers held in place.

- **Make sure Operator Presence Control (OPC) levers are working when adjustment is completed.**
- **Never operate this unit with Operator Presence Control (OPC) levers held in place.**

5. Squeeze one drive lever until an increased resistance is felt. This is where neutral should be.

Note: Make sure you have not reached the end of the neutral lock slot. If you have, shorten the control lever linkage. Refer to "Control Rod Adjustment (Pistol Grip Floating Deck)" on page 5 - 14.

6. If the wheel turns while holding the drive lever in neutral, the neutral control linkages need to be adjusted (Figure 88). If wheel stops, then go to step 12.

7. Loosen the nut against the neutral control linkage yoke (Figure 88).

8. Adjust the neutral control linkage until the respective drive wheel stops while the drive lever is pulled against the neutral spring (neutral position) (Figure 88).

9. Turn the adjusting bolt approximately 1/4 turn clockwise if the wheel is turning in reverse or turn the bolt approximately 1/4 turn counterclockwise if the wheel is turning forward (Figure 88).

10. Release the drive lever to the forward drive position and squeeze back into the neutral position. Check to see if the wheel stops. If not, repeat the above adjustment procedure.

11. After adjustments are made, tighten the nuts against the yokes.

12. Repeat this procedure for the opposite side.

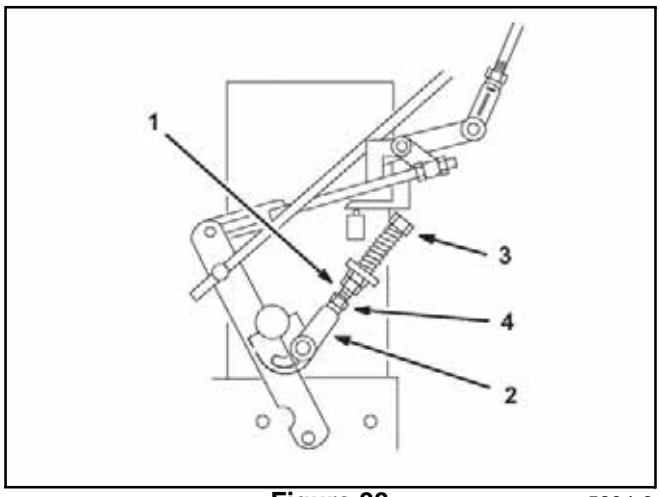


Figure 88 m-5394-2

(1) Neutral control linkage	(3) Adjusting bolt
(2) Yoke	(4) Nut

Hydro Control Linkage Adjustment (Pistol Grip Floating Deck)

WARNING

Engine must be running so control linkage adjustments can be performed. Contact with moving parts or hot surfaces may cause personal injury.

Keep hands, feet, face, clothing and other body parts away from rotating parts, muffler and other hot surfaces.

WARNING

Mechanical or hydraulic jacks may fail to support machine and cause a serious injury.

- **Use jack stand when supporting machine.**
- **Do not use hydraulic jacks.**

Left Side Linkage Adjustment

1. Raise the rear of the machine and place on jack stands.

2. Place the speed control lever in the neutral position.

3. Place the left drive lever in the full forward position.

4. Hold OPC levers down.

Note: The OPC levers must be held down whenever the speed control lever is out of the neutral position or the engine will kill.

WARNING

Electrical system will not perform proper safety shut off with Operator Presence Control (OPC) levers held in place.

- **Make sure Operator Presence Control (OPC) levers are working when adjustment is completed.**
- **Never operate this unit with Operator Presence Control (OPC) levers held in place.**

5. Loosen the front nut on left hydro control linkage as shown in Figure 89.

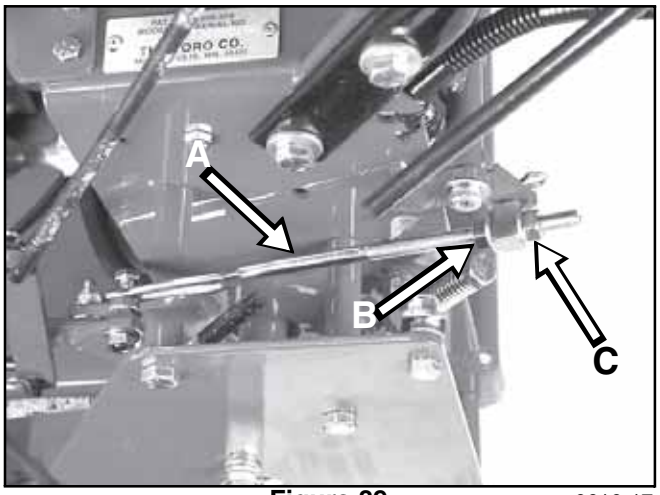


Figure 89 0610-17

(A) Hydro control linkage (B) Front nut	(C) Rear adjusting nut

6. Turn the left rear adjusting nut counterclockwise until wheel rotates forward (Figure 89).

7. Turn the rear adjusting nut clockwise 1/4 of a turn at a time. Then move the speed control lever forward and back to neutral. Repeat this until left wheel stops rotating forward (Figure 89).

8. Turn the rear nut an additional 1/2 turn and tighten the front nut.

Note: Make sure flat part of linkage is perpendicular to pin part of swivel.

9. After adjusting the left hydro control linkage, move the speed control lever forward and then back to the neutral position.

10. Make sure the speed control lever is in the neutral position and the tire does not rotate.

11. Repeat adjustment if needed.

Note: If inconsistent neutral occurs, check to be sure both springs are properly tightened on the speed control lever under the console, especially the rear pivot spring so the speed control lever is held firmly in place and does not slide, but not too tight where the speed control lever binds. Repeat above adjustments if necessary (Figure 90).

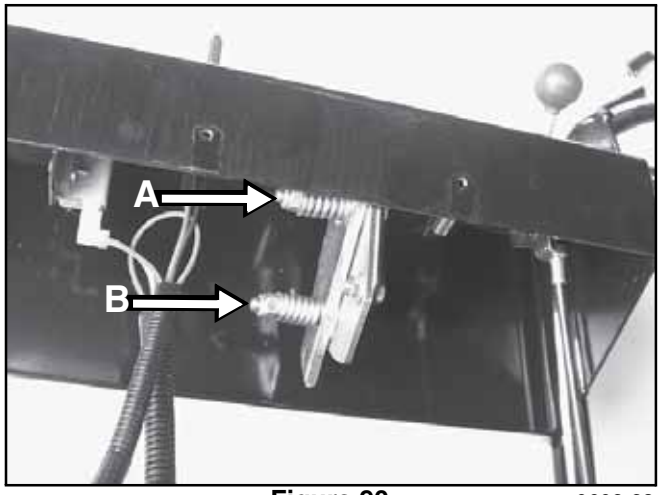


Figure 90 0602-28

(A) Rear pivot spring	(B) Spring

Right Side Linkage Adjustment

1. Place the speed control lever in the neutral position.

2. Place the right drive lever in the full forward position.

3. Hold OPC levers down.

Note: The OPC levers must be held down whenever the speed control lever is out of the neutral position or the engine will kill.

4. Adjust the right side linkage by turning the quick track knob counterclockwise until the tire begins to rotate forward (Figure 91).

5. Turn the knob clockwise 1/4 of a turn at a time. Then move the speed control forward and back to neutral. Repeat this until right wheel stops rotating forward (Figure 91).

6. The spring that keeps tension on the knob should normally not need adjustment. However if adjustment is needed, adjust the length of spring to 1 in. (26mm) between the washers (Figure 91).

7. Adjust spring length by turning nut at front of spring (Figure 91).

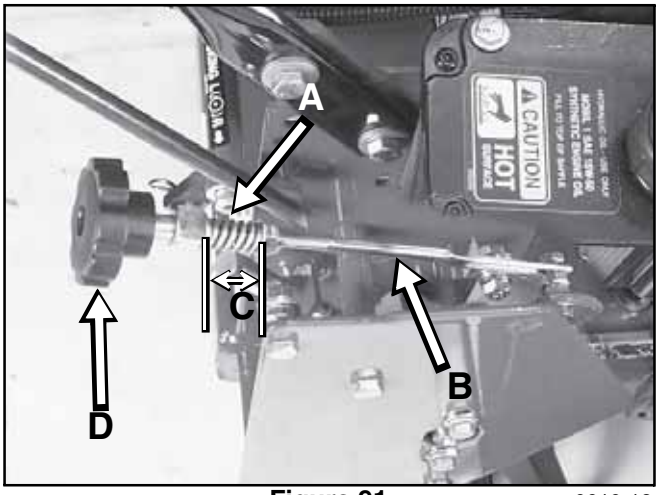


Figure 91 0610-19

(A) Spring	(C) 1 inch (26 mm)
(B) Hydro control linkage	(D) Quick track knob

Control Rod Adjustment (Pistol Grip Floating Deck)

Checking Control Rod

1. With rear of machine supported on jack stands and engine running at full throttle, move the speed control lever to the medium speed position.

Note: The OPC levers must be held down whenever the speed control lever is out of the neutral position or the engine will kill.

2. Move the respective drive lever upward until it reaches the neutral position and engage neutral locks.

3. If the tire rotates in either direction, the length of the control rod will need to be adjusted.

Adjusting Control Rods

1. Adjust the rod length by releasing the drive lever and removing clevis pin. Rotate the rod in the rod fitting (Figure 92).

2. Lengthen the rod if the tire is turning in reverse and shorten the rod if the tire is turning forward.

3. Rotate the rod several turns if the tire is rotating fast. Then, adjust the rod in 1/2 turn increments.

4. Release and engage neutral lock checking that the tire does not rotate. Continue this process until the tire does not rotate.

5. Place the hairpin back into clevis pin (Figure 92).

6. Repeat this adjustment for opposite side.

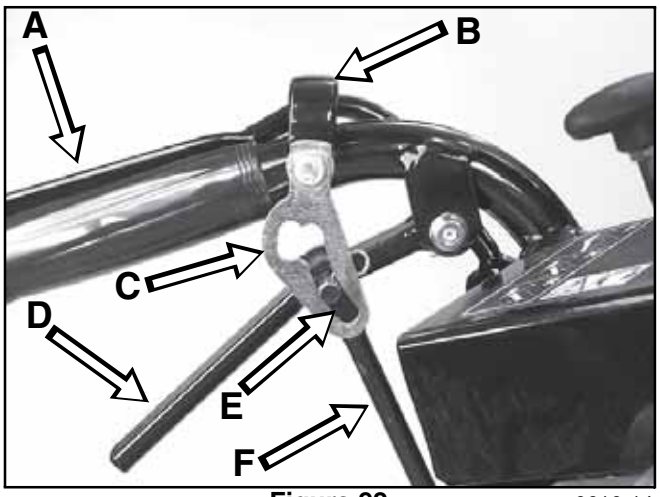


Figure 92 0610-14

(A) Handle	(D) Drive lever
(B) Neutral lock	(E) Full speed forward
(C) Neutral position	(F) Control rod

Tracking Adjustment

1. Remove machine from any jack stands.

2. Adjust rear and front tire pressure to specification. Check that front castors pivot freely

3. Run the unit and observe the tracking on a level, smooth, hard surface such as concrete or asphalt.

4. If the unit tracks to one side or the other, turn the quick track knob. Turn the knob right to steer right and turn the knob left to steer left (Figure 93).

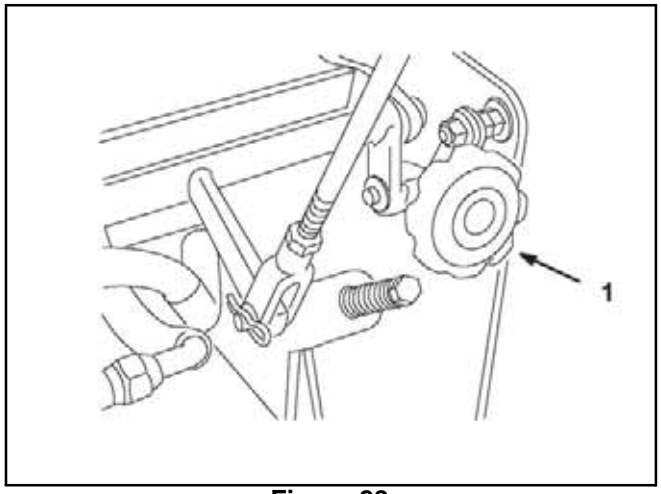


Figure 93 m-5398-2

(1) Quick track knob

Motion Control Linkage Removal (Pistol Grip Floating Deck)

1. Turn the ignition switch to off and disconnect the spark plug wire(s).

2. Remove the operator's manual tube from the handle bar assembly.

3. Remove the knob from the speed control lever.

4. Remove the hairpin cotter at each end of the upper control link (Figure 94).

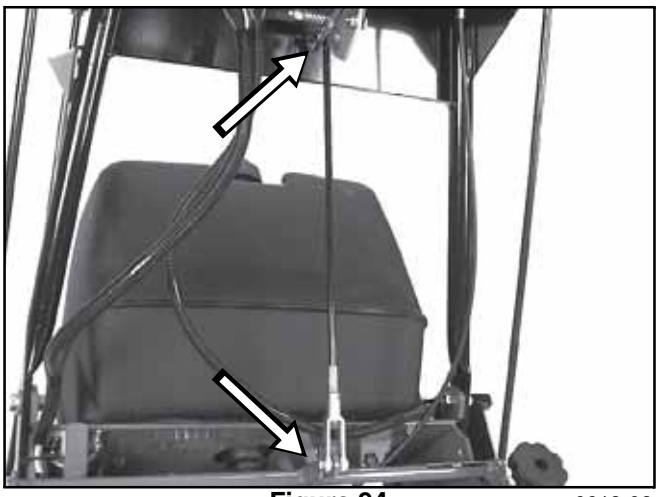


Figure 94 0618-02

5. To remove the speed control bellcrank, remove the hairpin cotters securing the hydro control link and tracking adjustment link to the bellcrank (Figure 95).

Figure 95 0602-32

6. Remove the 2 Allen head shoulder bolts from the ends of the bellcrank (Figure 96), and remove the bellcrank.

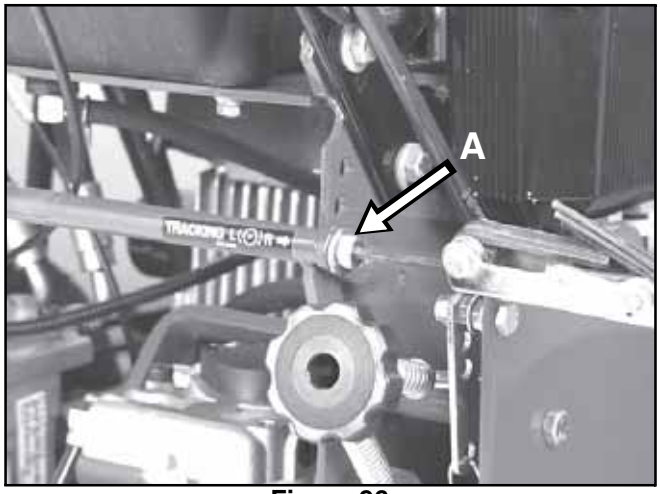


Figure 96 0602-27

7. Remove the nut securing the hydro control link (left side) and tracking control link (right side) to the pump control bellcrank (Figure 97).

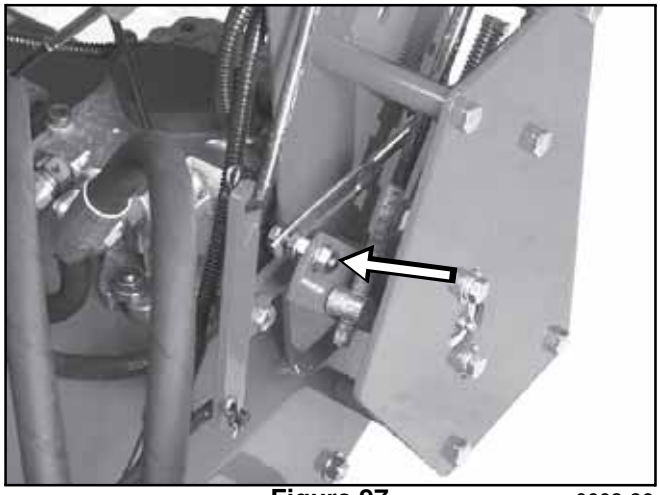


Figure 97 0602-26

8. Remove the return spring from the upper bracket (Figure 98).

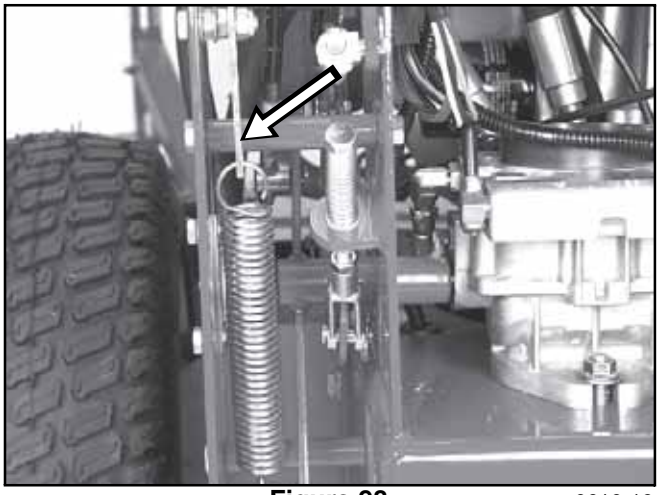


Figure 98 0610-16

9. Remove the nuts from the 4 bolts securing the shield from the frame (Figure 99).

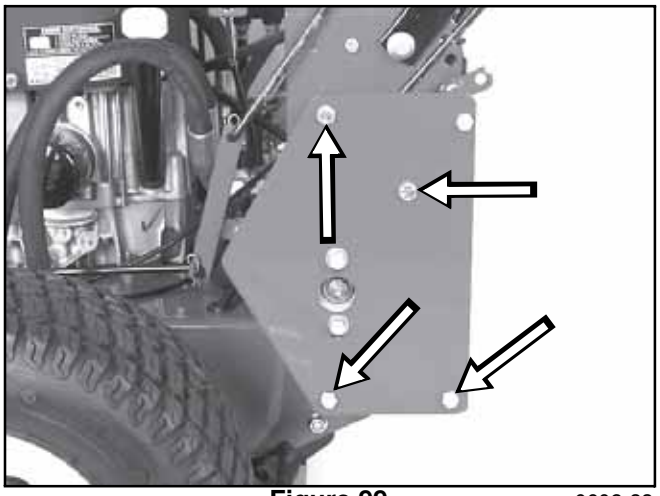


Figure 99 0602-33

10. Carefully pull the shield with the control shaft bearing, spacers, and through bolts from the frame (Figure 100).

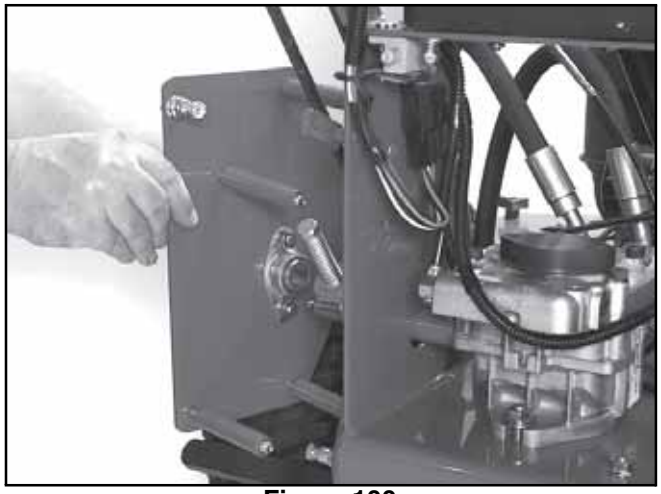


Figure 100 0602-22

11. Remove the hydro control shaft.

12. Remove the pin from the clevis on the neutral control link (Figure 101).

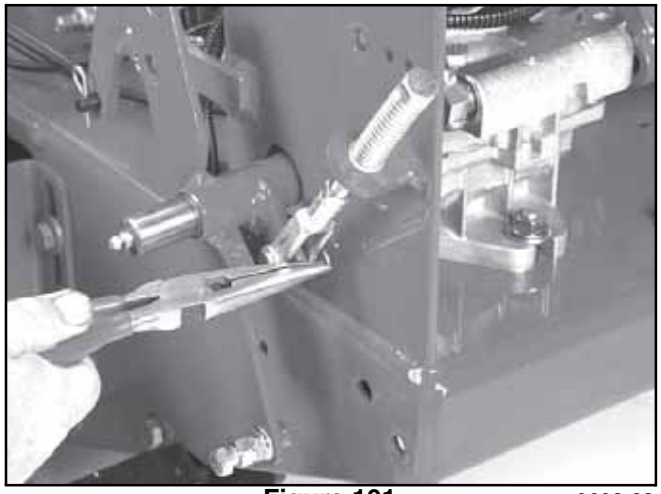


Figure 101 0602-23

13. Remove the “E” clip from the pivot on the pump control bellcrank (Figure 102).

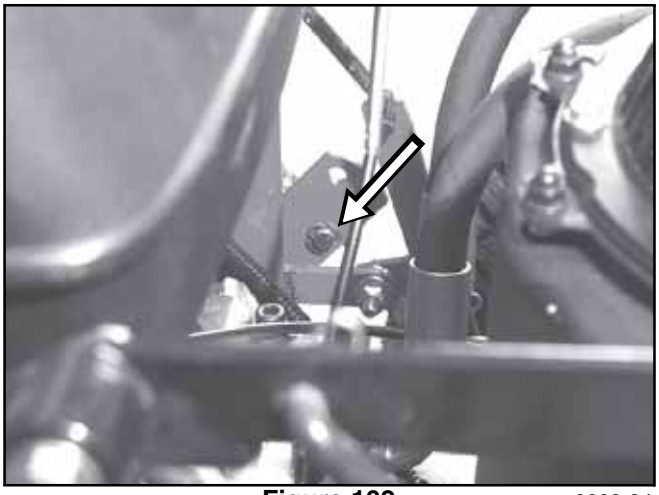


Figure 102 0602-24

14. Remove the hairpin clip from the reverse rod on the hand lever (Figure 103).

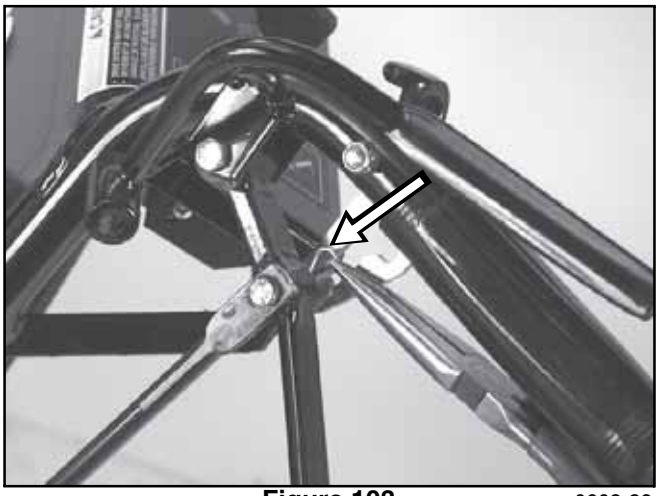


Figure 103 0602-29

15. Using a 5/16 8 point socket, loosen the set screw securing the hydro control shaft to the pump (Figure 104).

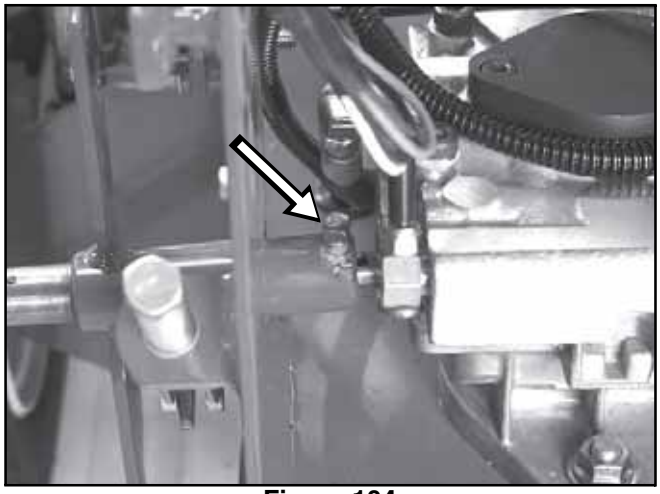


Figure 104 0602-21

16. Remove the shaft from the pump (Figure 105).

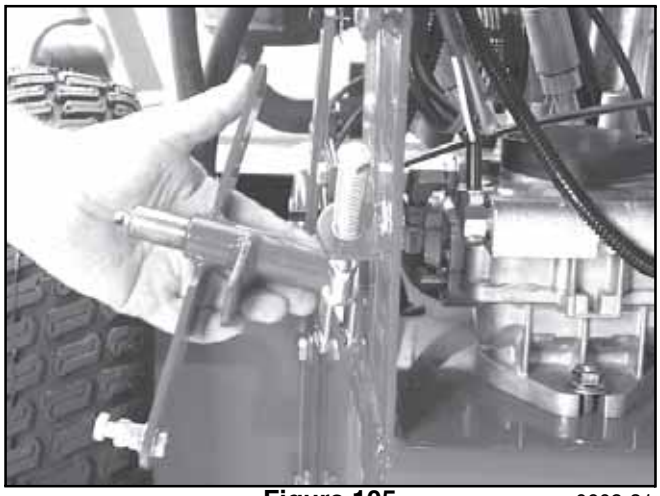
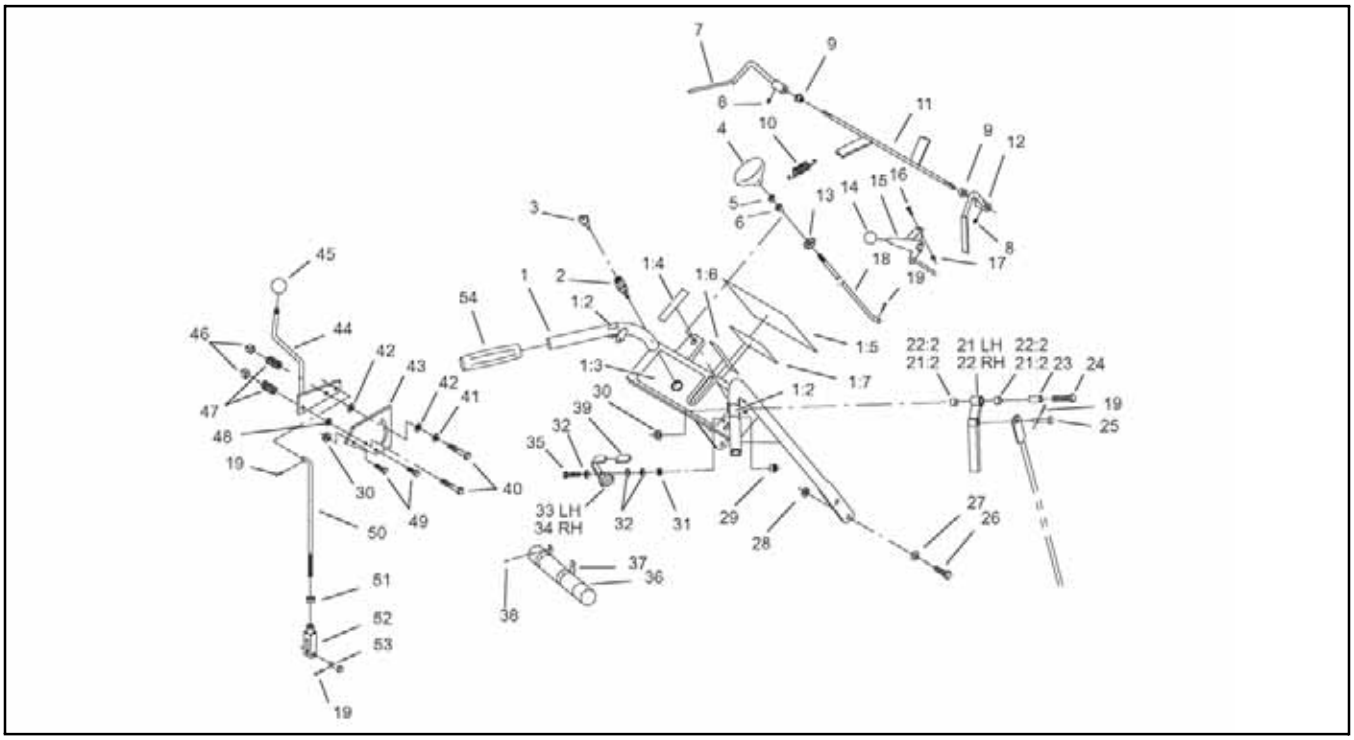


Figure 105 0602-31

Removal

Follow the removal procedures in reverse.

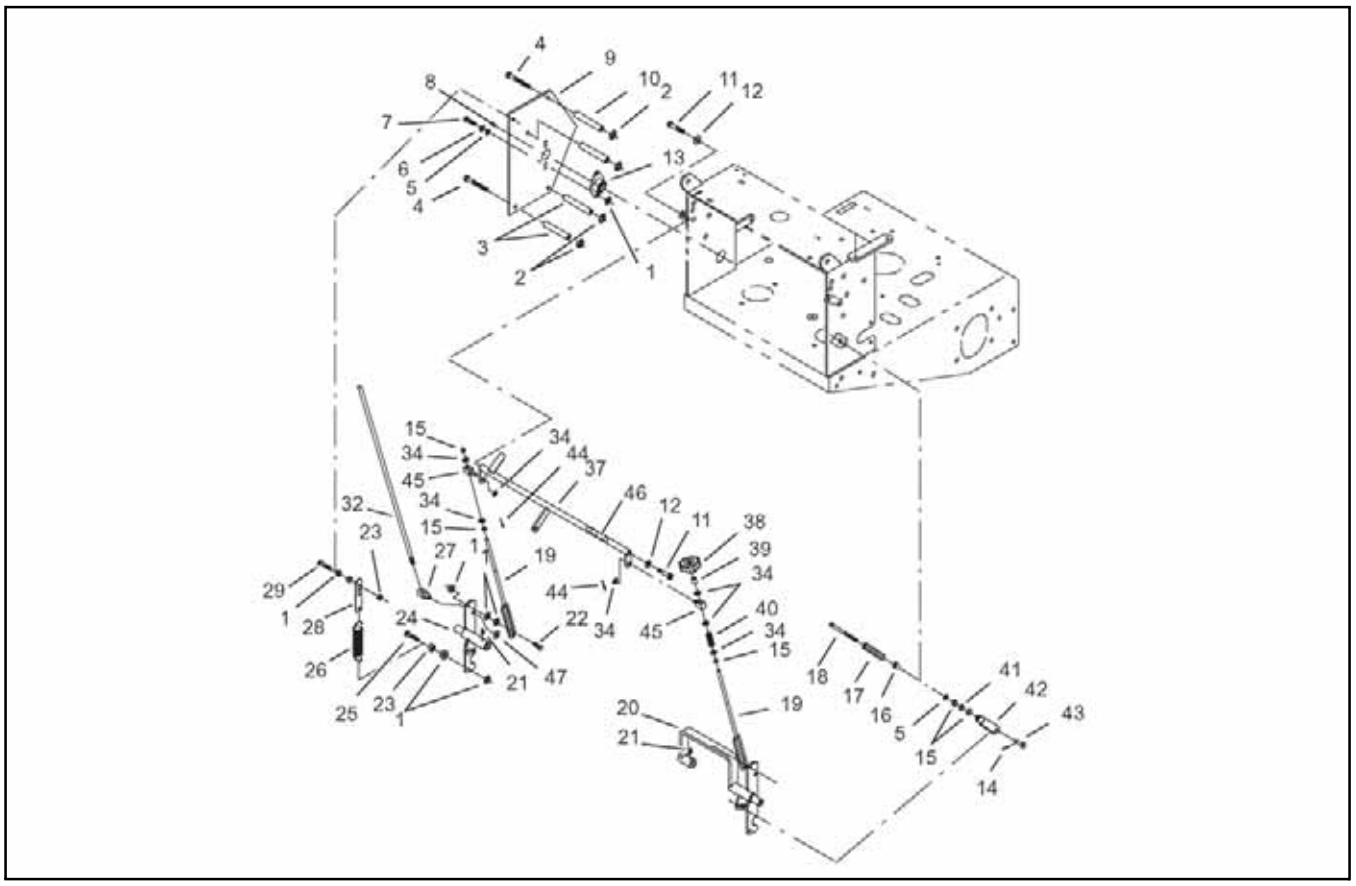
Upper Handle Assembly - Pistol Grip



Ref. No.	Qty.	Description
1	1	Handle ASM
1:2	2	Decal - Lock, Neutral
1:3	1	Decal - Warning
1:4	1	Decal - Throttle
1:5	1	Decal - Proline
1:6	1	Decal - Engage, Deck
1:7	1	Decal - Caution, Brake
2	1	Switch - Key
3	1	Key - Ignition
4	1	Knob - Push/Pull
5	1	Nut - Jam
6	1	Bearing - Nylon
7	1	Lever - LH
8	2	Screw - Set
9	2	Bushing - Nylon
10	1	Spring - Extension
11	1	Operator Presence Control Rod ASM
12	1	Lever - RH
13	1	Nut - Push
14	1	Knob - Ball
15	1	Cable - Throttle
16	2	Bolt - CARR
17	2	Nut - Lock
18	1	Linkage - Blade
19	3	Pin - Hair
21	1	LH Drive Lever ASM
21:2	2	Sleeve - Bushing
22	1	RH Drive Lever ASM
22:2	2	Sleeve - Bushing
23	2	Bushing - Lever, Drive

Ref. No.	Qty.	Description
24	2	Screw - HH
25	2	Pin - Clevis
26	4	Screw - HH
27	4	Washer - Belleville
28	4	Nut - HHF
29	2	Nut - Lock, NI
30	4	Nut - HF
31	2	Washer - Flat
32	6	Washer - Spring
33	1	Latch - Lever, LH Drive
34	1	Latch - Lever, RH Drive
35	2	Screw - HH
36	1	Tube - Manual
37	2	R - Clamp
38	2	Screw
39	2	Grip - Latch
40	2	Screw - HH
41	1	Washer - Friction
42	2	Washer - Friction
43	1	Plate - Lever, Shifter
44	1	Lever - Shift
45	1	Knob - Ball
46	2	Nut - Lock, NI
47	2	Spring - Compression
48	1	Washer - Flat
49	2	Screw - HH
50	1	Rod - Control, Speed
51	1	Nut
52	1	Yoke - Adjustable
53	1	Pin - Clevis
54	2	Grip - Handle

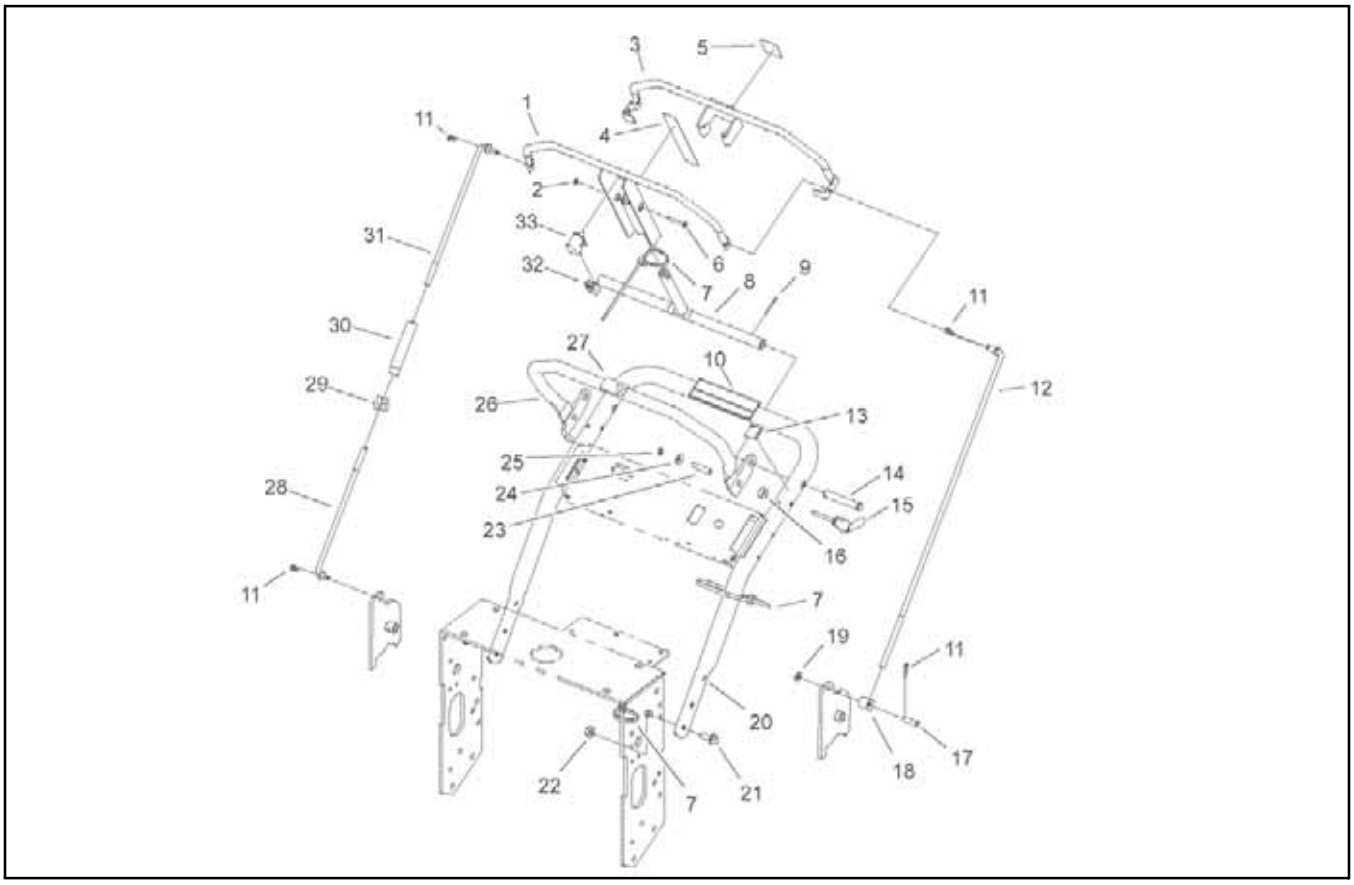
Lower Control Assembly - Pistol Grip



Ref. No.	Qty.	Description
1	12	Nut - HF
2	8	Nut - HHF
3	4	Spacer - Shield
4	7	Screw - HH
5	6	Washer - Flat
6	4	Washer - Lock
7	4	Screw - HH
8	2	Fitting - Grease
9	2	Shield - Controls, Hydro
10	4	Spacer - Shield
11	2	Screw
12	2	Washer - Flat
13	2	Bearing - Flange, Side
14	2	Pin - Hair
15	7	Nut - Hex
16	2	Bushing - Flanged
17	2	Spring - Return, Neutral
18	2	Bolt - Return, Neutral
19	2	Link - Control, Speed
20	1	Shaft - Control, RH
21	2	Screw

Ref. No.	Qty.	Description
22	2	Screw - HH
23	4	Nut - Lock, NI
24	1	Shaft - Control, LH
25	2	Screw - HH
26	2	Spring - Extension
27	2	Swivel - Lever, Drive
28	2	Tab - Spring, Extension
29	2	Bolt - TAP HH
32	2	Rod - Lever, Drive
34	7	Washer - Flat
37	1	Crank - Control, Speed
38	1	Knob - Tracking
39	1	Spacer
40	1	Spring - Compression
41	2	Nut
42	2	Yoke - Adjustable
43	2	Pin - Clevis
44	2	Pin - Cotter
45	2	Swivel - Adjustable, Short
46	1	Decal - Tracking
47	2	Ring - Retaining

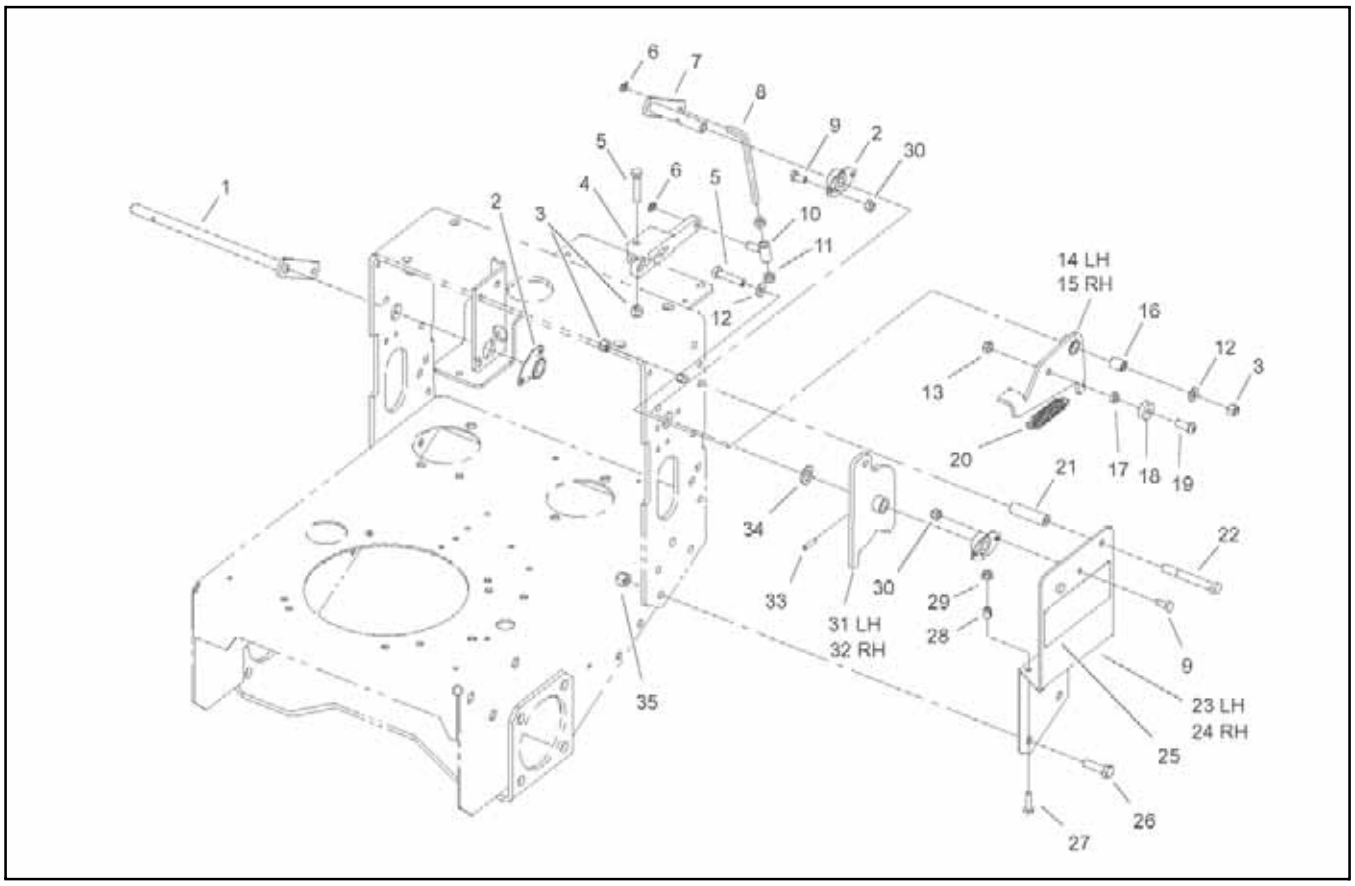
Upper Handles Assembly - T-Bar



Ref. No.	Qty.	Description
1	1	Control Bar ASM
2	1	Nut–Lock
3	1	Bail ASM
4	1	Decal–T Bar
5	1	Decal–Drive, Traction
6	1	Screw–SHH
7	3	Tie–Cable
8	1	Pivot ASM
9	2	Pin–Cotter
10	1	Decal – Warning
11	4	Pin–Hair
12	1	Rod – Control
13	1	Decal–Lock, Speed
14	2	Pin–Clevis
15	2	Quick Release Lock ASM
16	2	Spacer
17	1	Pin–Clevis

Ref. No.	Qty.	Description
18	1	Fitting–Rod
19	1	Washer–Flat
20	1	Handle – Upper
21	4	Screw–HHF
22	4	Nut–HF
23	2	Sleeve
24	2	Washer–Belleville
25	2	Nut–Lock
26	1	Handle ASM
27	1	Decal–Protection, Ear
28	1	Rod–Control, Lower
29	1	Nut–Wing
30	1	Turnbuckle
31	1	Rod–Control, Upper
32	1	Connector–Body
33	1	Switch–Bail

Lower Controls Assembly - T-Bar



Ref. No.	Qty.	Description
1	1	Lever–Pivot, RH
2	4	Side Flange Bearing ASM
3	6	Nut–Lock
4	2	Arm–Pump
5	4	Screw–HH
6	4	Ring–Grip, Ex
7	1	Lever–Pivot, LH
8	2	Rod–Link
9	8	Screw–HH
10	2	Sleeve
11	4	Nut–Jam
12	4	Washer–Flat
13	2	Nut–Lock, NI
14	1	Arm–Detent, LH
*15	1	Arm–Detent, RH
16	2	Bushing–Arm, Detent
17	2	Spacer–Bearing
18	2	Bearing

Ref. No.	Qty.	Description
19	2	Screw–HSBH
20	2	Spring–Detent
21	2	Stop–Reverse
22	2	Screw–HH
23	1	Bracket–Pivot, Left
*24	1	Bracket–Pivot, Right
25	2	Decal–Hydro
26	6	Screw–HH
27	2	Screw–HH
28	2	Spacer – Tubular
29	2	Locknut–Flange
30	8	Nut–Lock, NI
31	1	Arm–Pivot, LH
*32	1	Arm–Pivot, RH
33	2	Pin–Roll
34	2	Washer–Thrust
35	6	Nut–Lock, NI

Hydraulic Testing

Tools Needed:

- Hydro-Gear manual 492-4749
- Hydraulic flow tester - BDP Flow Test Kit 70661, or equivalent
- Jack
- Jack stands
- 15/16" open end wrench
- 7/16" open end wrench
- 13/16" Socket or Air Impact
- Ratchet
- Oil Pan
- Torque wrench
- Toro Hydraulic Troubleshooting CD P/N 492-4777 CD # 2

Installation And Testing Procedures:

Using the Bi-Directional Flow Test Kit, determination of directional flow is not necessary. The flow meter may be connected in either direction into the forward and reverse high pressure system lines.

Caution: Ensure all fittings and hoses are attached securely. This test is being completed on the vehicle's high pressure system lines. Failure to perform this properly could result in bodily injury.

1. Jack up rear axle - support unit with jack stands (Figure 106).

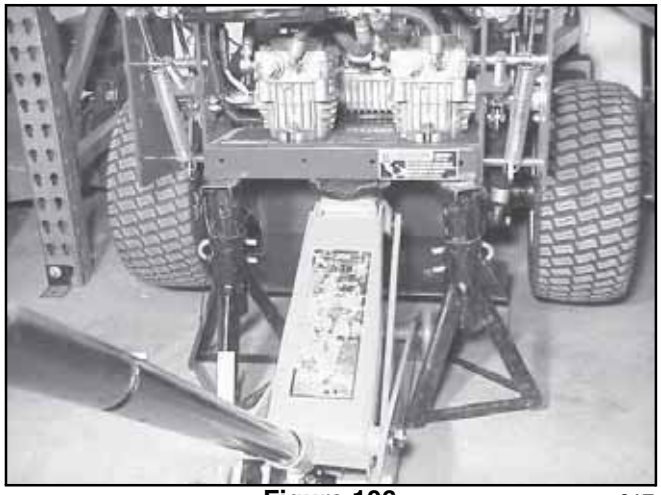


Figure 106 mvc-017

2. Remove wheel on the side to be tested and place oil pan under wheel motor (Figure 107).

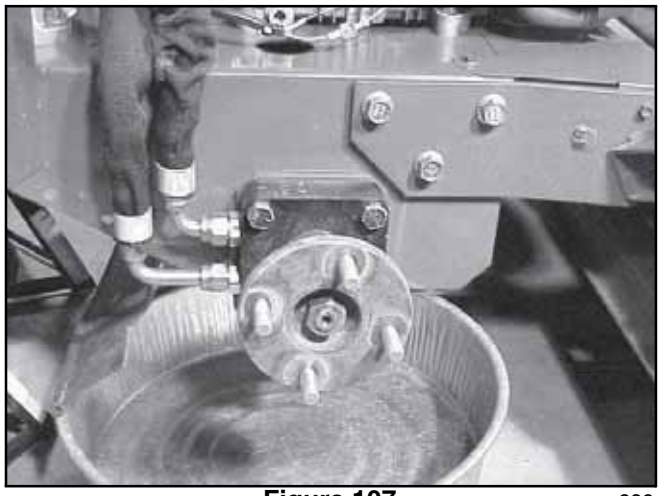


Figure 107 mvc-889

3. Remove upper hydraulic line from wheel motor and attach to flow test gauge (Figure 108).

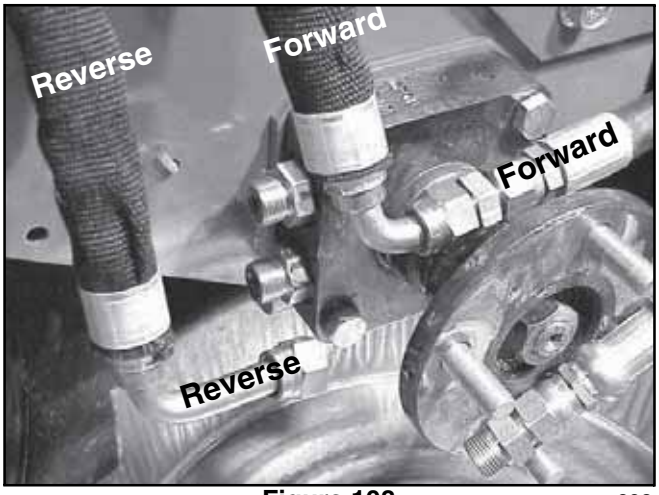


Figure 108 mvc-893

4. Remove lower hydraulic line from wheel motor and attach to the other side of the flow test gauge(Figure 109).

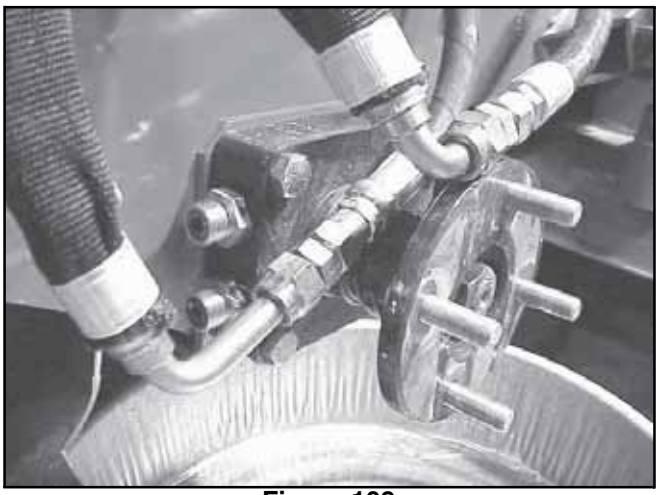


Figure 109 mvc-890

Note: When using a flow test gauge that is NOT bi-directional and it is connected in this manner, it is important not to operate the machine in reverse or you could damage the flow test gauge.

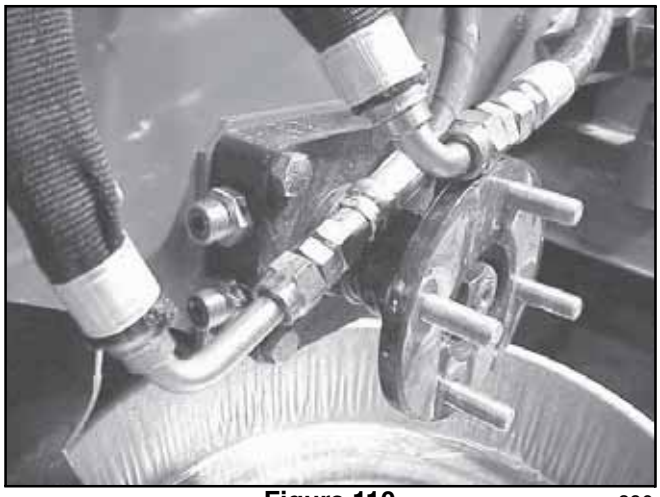


Figure 110 mvc-890

5. Open the restriction valve all the way (counterclockwise) (Figure 111).

Figure 111 mvc-894

6. Run the machine for 2 minutes in forward (no load) to purge air from the system.

7. Run engine at full throttle (no load) - verify RPM with a tachometer - 3200 + or - 150 RPM's. **Do not exceed 3600 RPM.**

8. With the drive control fully forward (Pistol Grip, Figure 112, T-Bar, Figure 113) slowly tighten the restriction valve until the gauge indicates 300 PSI (21 bar).

Figure 112 mvc-896

Record the flow reading from the bi-directional flow meter. Refer to the Hydro-Gear manual for acceptable GPM. Make a second flow reading at 1100 PSI and record. Subtract the first reading from the second reading and determine if this is an acceptable GPM.

Figure 113 mvc-898

Example:

1st Reading 300 psi (21 bar) reading 7 gpm (26l/min).

2nd Reading 1100 psi (76 bar) reading 3 gpm (11l/min).

300 psi (21 bar) reading

7gpm (26l/min) (1st reading)
- 3gpm (11l/min) (2nd reading)
4 gpm (15l/min) (the difference)

Subtract 1st reading from the 2nd. (In this example, 4gpm difference would indicate a defective pump).

An acceptable "flow droop" or difference is: 1.5 gpm (5.6 liter/min).

9. When test is complete and if necessary repairs have been made - reassemble hydraulic lines to wheel motor and reassemble wheel to hub and torque wheel nuts to 85 ft. lbs. (115 N-m) + or - 8 ft. lbs.

10. Test operate machine and purge air from hydraulic system.

Wheel Motor Removal and Installation - Floating Deck

1. Identify hydraulic lines.

2. Remove hydraulic lines from wheel motor.

3. Unbolt 4 screws holding wheel motor to chassis. Note: If wheel hub is to be removed, see step 5 on page 5 - 26, Figure 115.

Wheel Motor Removal - Fixed Deck

1. Apply the parking brake and loosen the 4 lug nuts.

2. Remove the cotter key and remove the hub nut, then release the parking brake (Figure 114).

Figure 114 0602-59

3. Raise the unit until the drive wheels are off the ground, then place the unit on jack stands.

4. Remove the drive wheel.

5. Install the hub puller (P/N TOR4097) on the wheel studs (Figure 115). Tighten the forcing screw to remove the hub from the tapered wheel motor shaft.

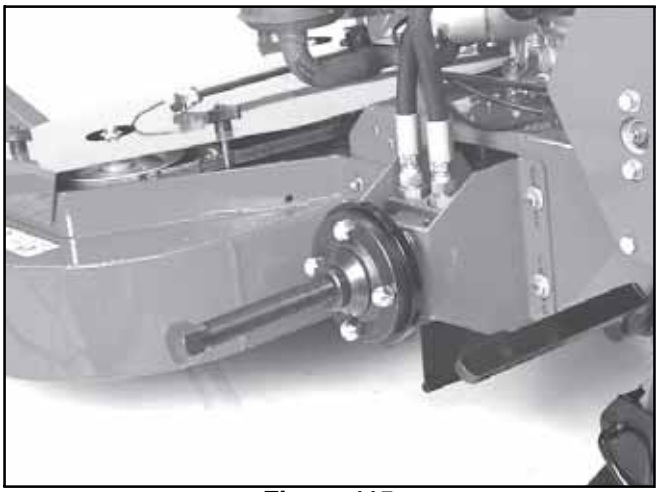


Figure 115 0662-58

6. Drain the hydraulic oil reservoir by removing the return and supply lines.

7. Thoroughly clean area round hydraulic fittings to prevent dirt from entering the system.

8. Mark the hose locations (Figure 116). Then remove the hoses at the wheel motor fittings.

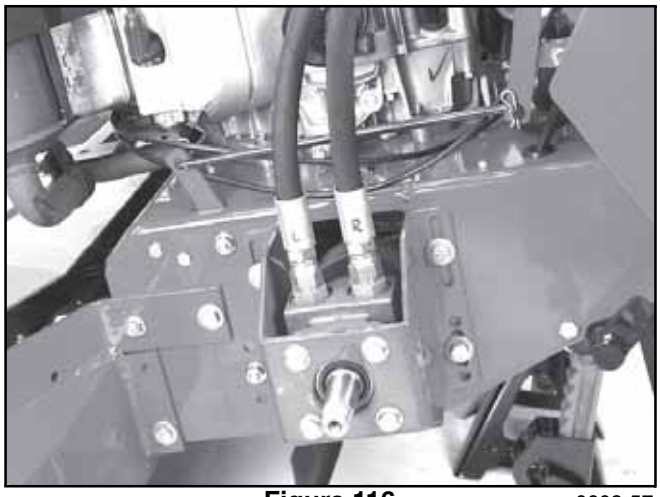


Figure 116 0602-57

9. Cap the pump and hose end fittings (Figure 117) and tie the hose ends out of the way.

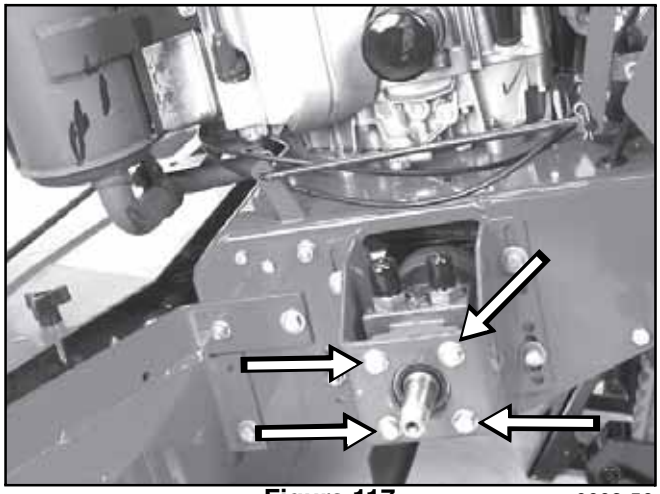


Figure 117 0602-56

10. Remove the 4 mounting bolts and remove the wheel motor from the unit (Figure 117).

Wheel Motor Installation

1. Slide the wheel motor into position from under the unit. Secure it to the frame with the 4 mounting bolts. Torque to 30 ft. lbs. (41 N-m).

2. Install new ‘O’ rings on the motor fittings. Install the hose fittings.

3. Align the wheel hub to the woodruff key on the motor shaft. Slide hub into position and thread the nut onto the shaft to hold the hub in position. Slide the wheel onto the hub and snug up the lug nuts. Apply the parking brake and tighten the hub nut to 165 ft. lbs. (224 N-m) and install the cotter key.

4. Reconnect the return and supply lines to the reservoir and refill with fresh oil until the level is 1/4” (6mm) below the top baffle (Figure 123).

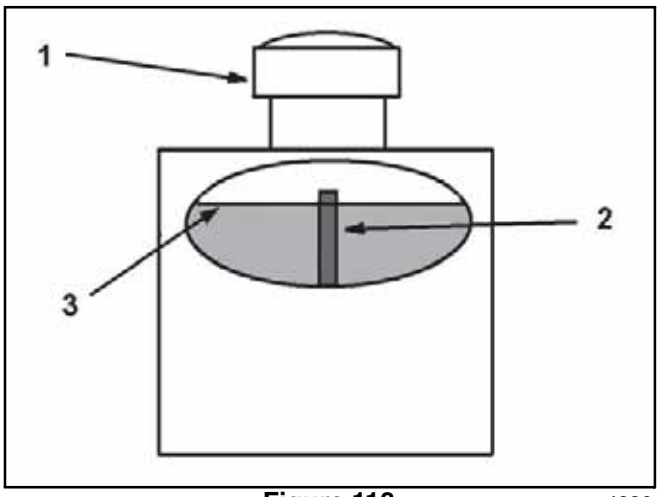


Figure 118 m-4280

(1) Cap (2) Baffle	(3) Fluid level - full

5. Bleed air from the system:

6. Start the engine and run at idle speed. Engage traction on one side and spin the wheel by hand.

7. When the wheel begins to spin on its own, keep it engaged until wheel drives smoothly (minimum 2 minutes).

8. Check hydraulic fluid level as it drops and add as required to maintain proper level.

9. Repeat procedure on opposite wheel.

10. Lower unit to the ground and tighten lug nuts to 85 ft. lbs. (115 N-m). Tighten lug nuts in a crisscross pattern from top to bottom - left to right.

Pump Removal

1. Thoroughly clean the area around the pump and hydraulic fittings to prevent dirt from entering the system.

2. Remove the drive pulley.

3. Use the cold start ring to remove tension from the pump drive belt.

4. Loosen the two set screws and slide the pulley off the pump shaft. Remove the woodruff key from the shaft (Figure 119).

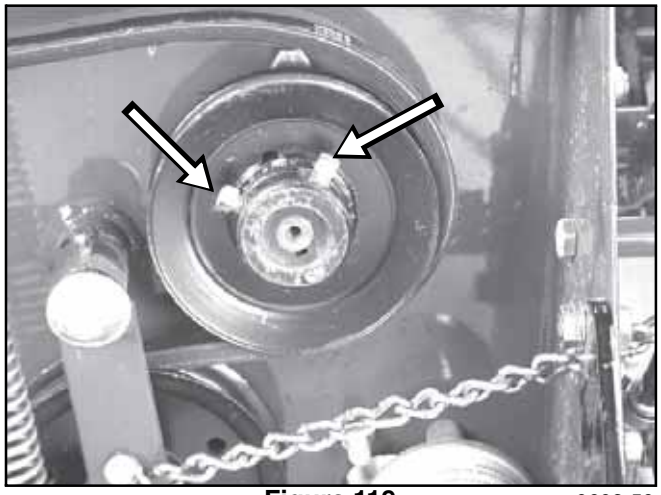


Figure 119 0602-50

Note: When installing the pulley, slide it onto the shaft until the end of the shaft is flush with the bottom of the counter bore in the pulley.

5. Drain the fluid reservoir by removing the return and supply lines.

6. Mark the fittings to prevent reversing them when they are reinstalled. Hold the pump fitting stationary while removing the hose fittings from the pump. Cap the fittings to prevent dirt from entering the system (Figure 120).

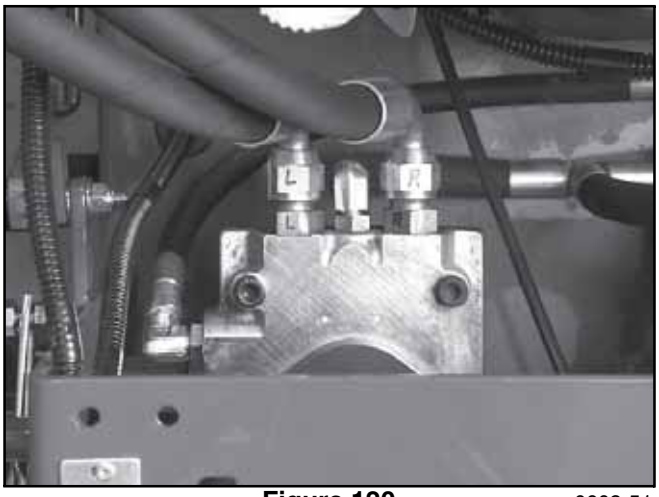


Figure 120 0602-51

Note: Fuel tank removed for clarity.

7. Remove the return line from the 90° fitting located on the side of the pump (Figure 121).

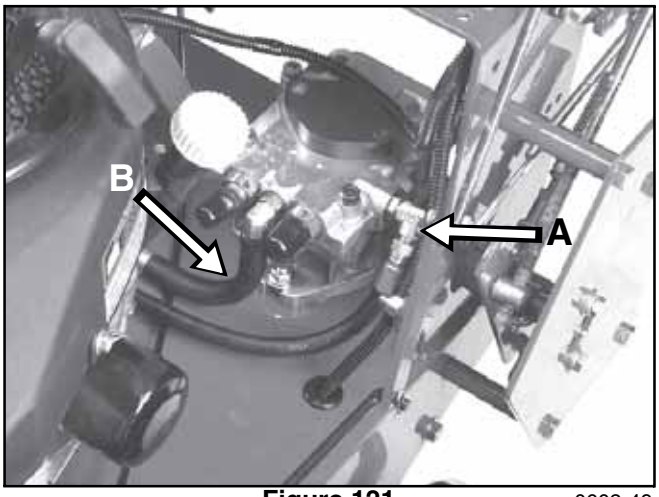


Figure 121 0602-49

(A) Return line	(B) Supply line

8. To remove the supply line, slide the hose clamp at least 2" (50mm) down the supply hose to clear the barbed fitting (Figure 121). Pull the hose off the fitting and cap both the supply hose and fitting.

9. Use a 5/16 8 point socket to loosen the set screw on the control linkage. Remove the pump mounting bolts and slide the control shaft out of the linkage (Figure 122).

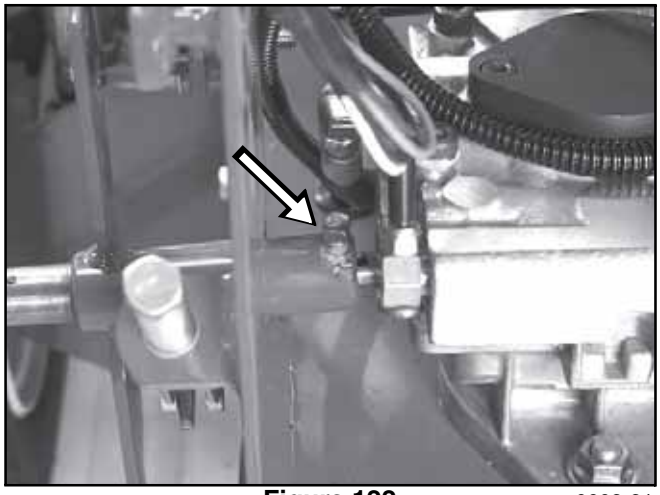


Figure 122 0602-21

10. To replace the pump, reverse the above steps.

11. Reconnect the return and supply lines to the reservoir and refill with fresh oil until the level is 1/4" (6mm) below the top baffle (Figure 123).

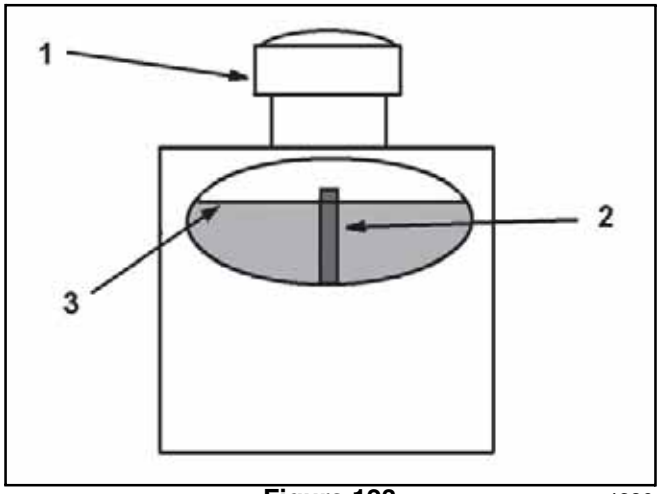


Figure 123 m-4280

(1) Cap (2) Baffle	(3) Fluid level - full

12. Raise the rear of the machine and support on jack stands so the wheels are off the ground.

13. Bleed air from the system:

14. Start the engine and run at idle speed. Engage traction on one side and spin the wheel by hand.

15. When the wheel begins to spin on its own, keep it engaged until wheel drives smoothly (minimum 2 minutes).

16. Check hydraulic fluid level as it drops and add as required to maintain proper level.

17. Repeat procedure on opposite wheel.

THIS PAGE INTENTIONALLY LEFT BLANK

Transmission Removal - Gear Drive

1. Raise the rear of the unit and place on safety stands.
2. Remove the spring from the belt tensioning arm (Figure 124).
3. Remove the pivot bolt and tensioning arm assembly (Figure 124).

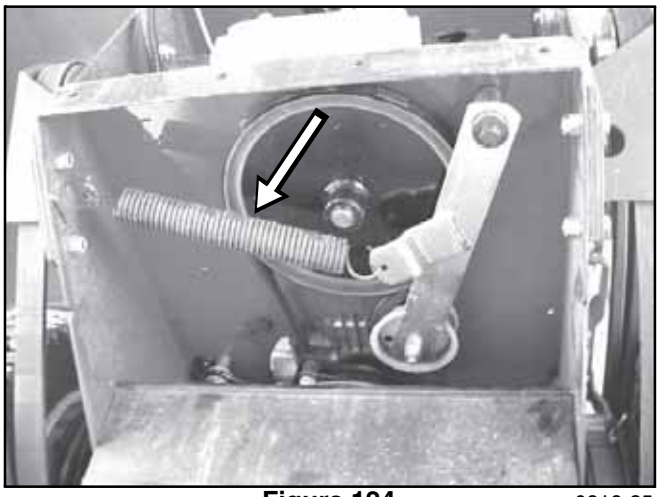


Figure 124 0819-35

4. Remove the external snap ring and loosen the transmission pulley set screw (Figure 125).

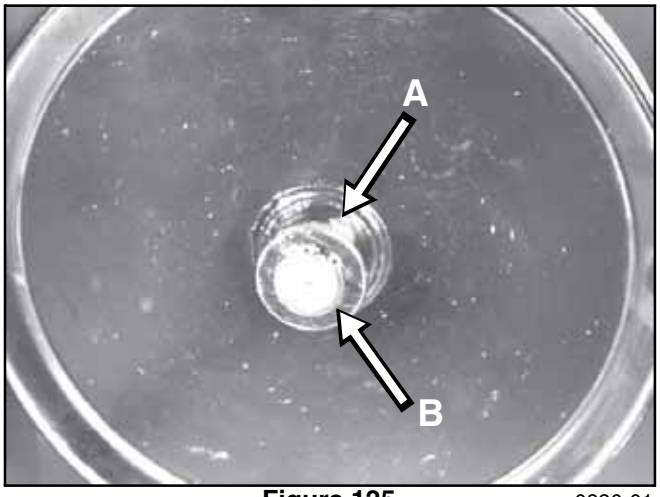


Figure 125 0820-01

(A) Set screw	(B) Snap ring

5. Slide the pulley off the transmission input shaft.
6. Remove the hairpin cotter and washer securing the control rod to the idler bracket. Remove the control rod from the bracket (Figure 126).

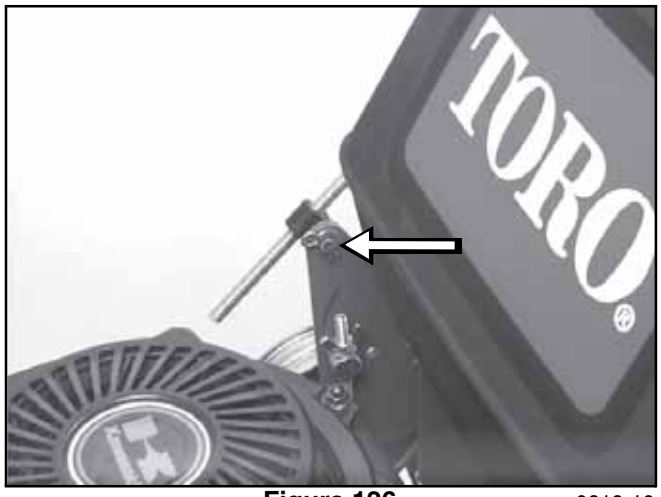


Figure 126 0819-16

7. Remove the hairpin cotter and washer from the brake rod and remove the brake rod from the idler bracket (Figure 127).

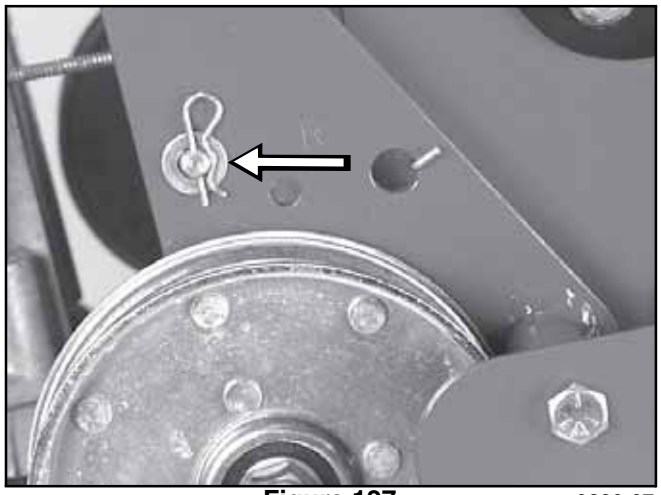


Figure 127 0820-07

8. Remove the 3 nuts and bolts securing the idler support to the frame (Figure 128). Remove the idler support, idler bracket and torsion spring from the frame.

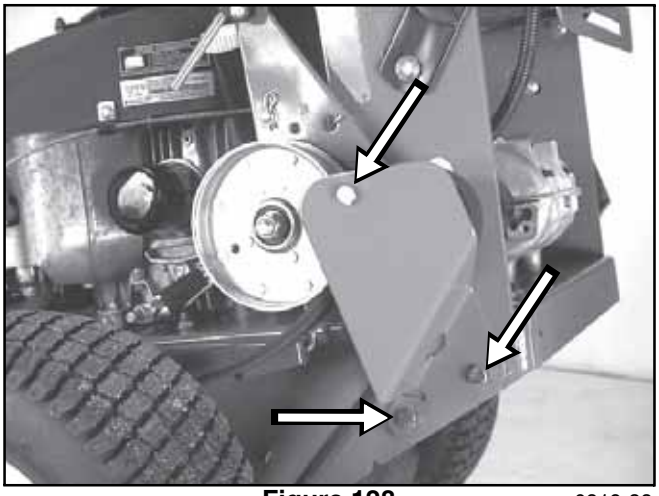


Figure 128 0819-38

9. Remove the 2 nuts and bolts securing the bearing to the frame (Figure 129).

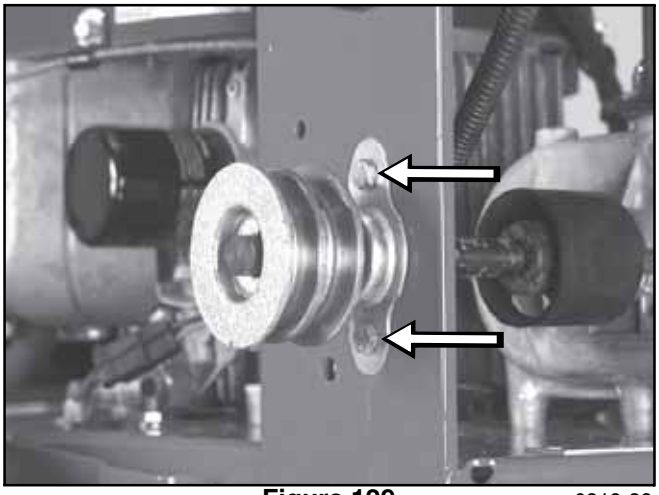


Figure 129 0819-39

10. Pull the extension shafts out of the splined couplers and through the frame (Figure 130).

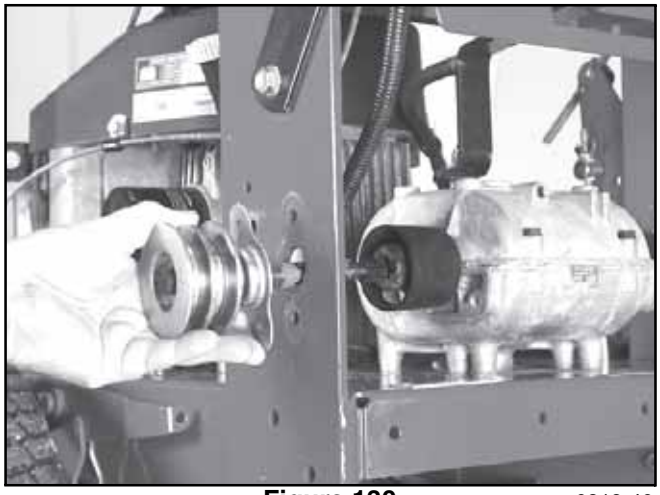


Figure 130 0819-40

11. Remove the nut securing the shift lever to the transmission (Figure 131).

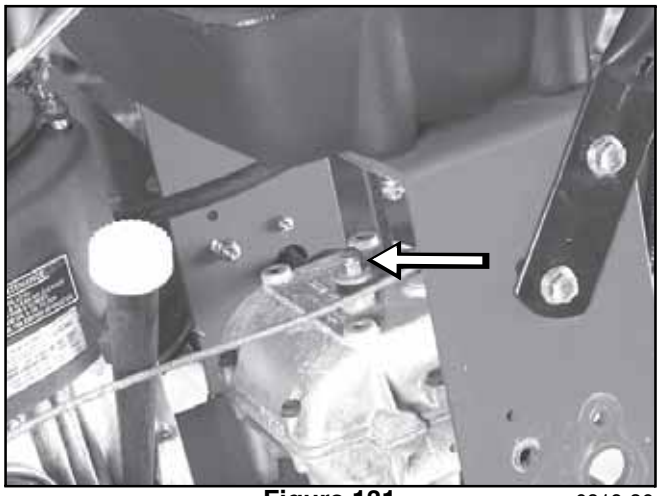


Figure 131 0819-36

12. Remove the 4 transmission mounting bolts and remove the transmission (Figure 132).

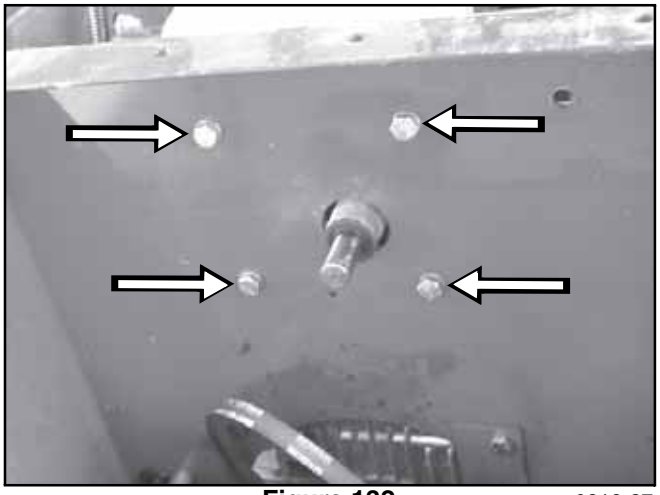


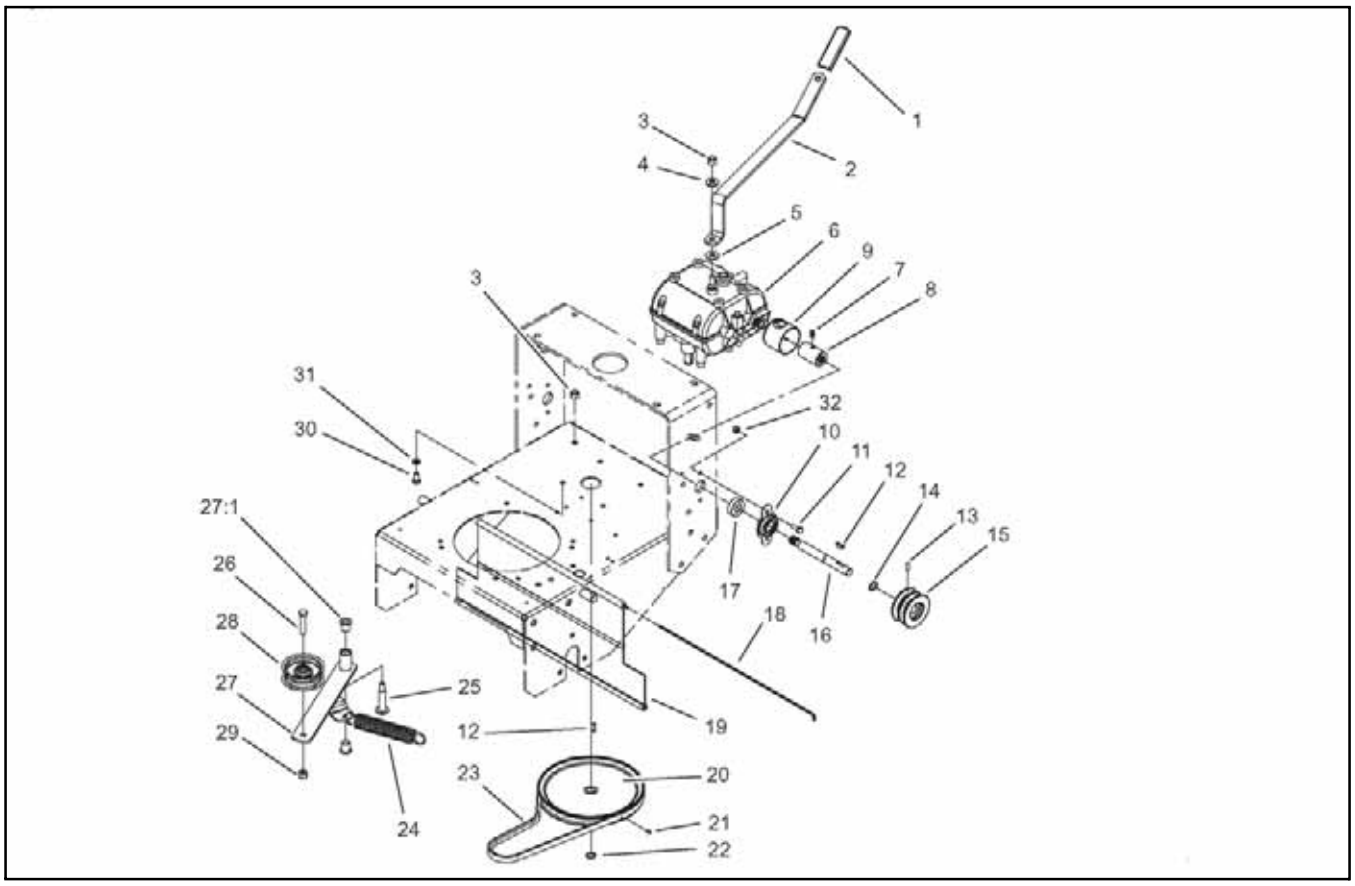
Figure 132 0819-37

Installation

Follow the removal procedures in reverse. **NOTE:** For transmission service procedures, refer to the appropriate Peerless Service Manual.

GEAR DRIVE TRANSMISSION

Transmission Drive Assembly



Ref. No.	Qty.	Description
1	1	Grip
2	1	Lever - Shift
3	2	Nut - Lock, NI
4	1	Washer - Belleville
5	1	Washer
6	1	Transmission
7	2	Fitting - Grease
8	2	Coupler
9	2	Guard - Coupler
10	2	Flange - Output
11	4	Screw - HH
12	3	Key - Woodruff
13	2	Screw - Set
14	2	Ring - Retaining
15	2	Pulley - Transmission
16	2	Shaft - Output
17	2	Bearing - Shaft
18	1	Rod - Shield
19	1	Shield - Trailing
20	1	Pulley - Driven
21	1	Screw - Set, HSH
22	1	Ring - Snap, External

Ref. No.	Qty.	Description
23	1	V - Belt
24	1	Spring
25	1	Bolt - Wheel
26	1	Screw - HH
27	1	Lever - Idler
27:1	2	Bushing - Flange
28	1	Pulley
29	1	Nut - Lock, NI
30	4	Screw - HH
31	4	Washer - Lock
32	4	Nut - Lock, NI

Control Linkage Removal (T-Bar)

1. Disconnect wiring for operator presence control (OPC) switch from T-Bar.

2. Disconnect the plug from the OPC switch (Figure 133).

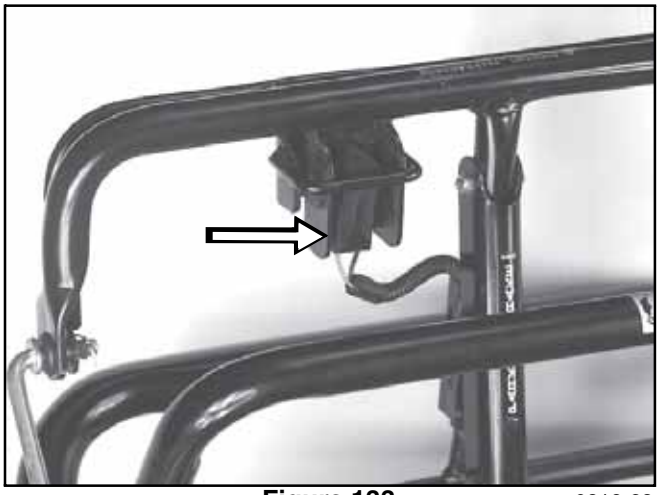


Figure 133 0819-28

3. Remove the spade connectors from the plastic plug by depressing the connector lock with a paper clip or special tool (Figure 134). **NOTE:** When assembled, the orange wire should be on the operator's right.

Figure 134 0819-11

4. Pull the wire harness from the tube in the T-Bar (Figure 135).

Figure 135 0819-15

5. Remove the cotter pins connecting the link to the T-Bar. This will also allow removal of the OPC handle (Figure 136).

Figure 136 0819-10

6. Remove the hairpin cotters and washers securing the trunnions to the idler brackets (Figure 137).

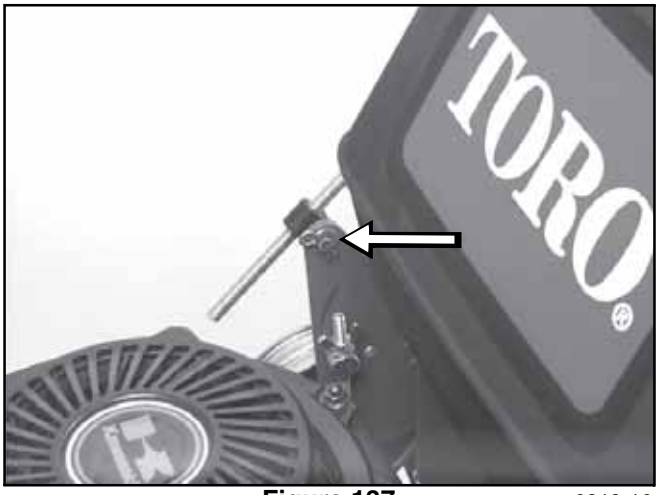


Figure 137 0819-16

7. Remove the cotter pins from the T-Bar.

8. Remove the pivot pins securing the T-Bar to the handle (Figure 138).

Figure 138 0819-12

Installation

Follow the removal procedures in reverse.

Control Linkage Adjustment (T-Bar Gear Drive)

1. Check the initial adjustment of the control rods. The control rods should be threaded through the rod fittings approximately 3” (76mm) (Figure 139).

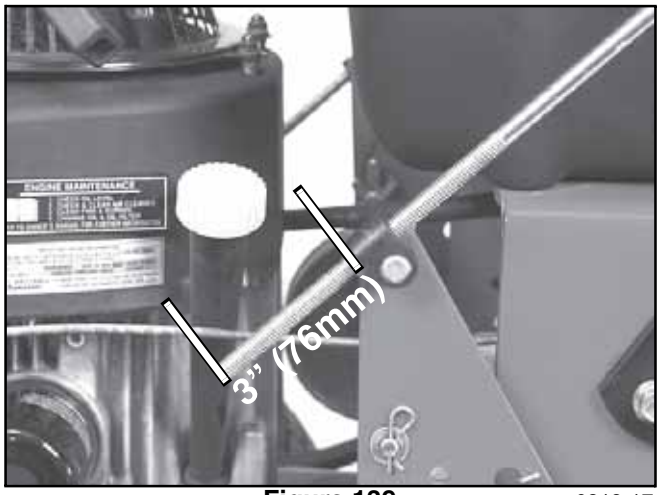


Figure 139 0819-17

2. Check the parking brake engagement. The parking brake lever should swing into a snug position against the upper handle while pulling back on the upper control bar (Figure 140).

Figure 140 0819-09

3. Check operation. If adjustment is required, remove the hairpin cotter and washer and adjust the rod fittings up or down on the control rod, as needed.

   NOTE: The control bar and upper handle must be parallel when in the relaxed drive and brake positions.

4. Check pulley travel. The idler pulleys should move approximately 3/4" (19mm) to properly tension the wheel belts (Figure 141).

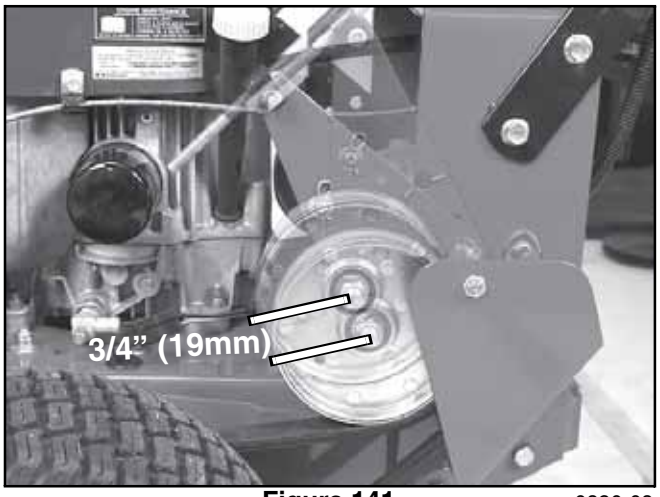


Figure 141 0820-08

5. If pulley travel is more than 3/4" (19mm), the brakes must be adjusted. Refer to Checking and Adjusting the Brake, page 4 - 6 through 4 - 8.

Linkage Adjustment (Pistol Grip Gear Drive)

Parts needed for this step:

Qty.	Part
2	Control rods
2	Cotter pin
2	Clevis Pin
2	Washer
2	Hairpin cotter pin

Procedure

1. Install control rods into the bell cranks and secure them with the hairpin cotters (Figure 142).

Note: Install rod fittings so the clevis pin is above the control rod, as shown in Figure 142.

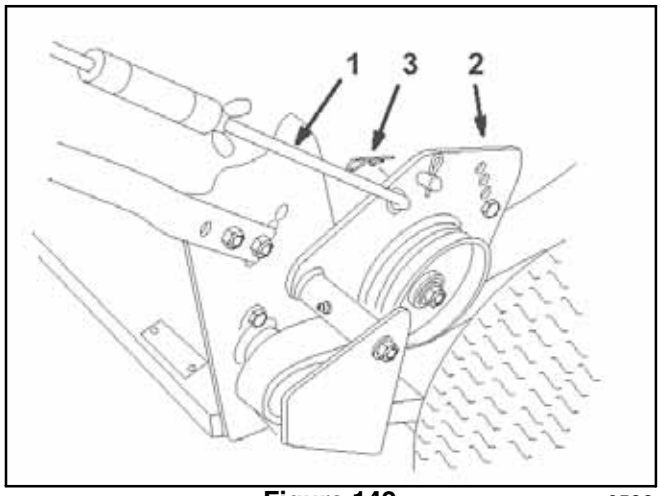


Figure 142 m-6592

(1) Control rod (2) Bell crank	(3) Hairpin cotter

2. Place the clevis pin into the upper part of the control rods, drive lever and neutral/parking brake locks (Figure 143).

3. Install the hairpin cotter pins between the drive levers and neutral/parking brake locks and into the clevis pins (Figure 143).

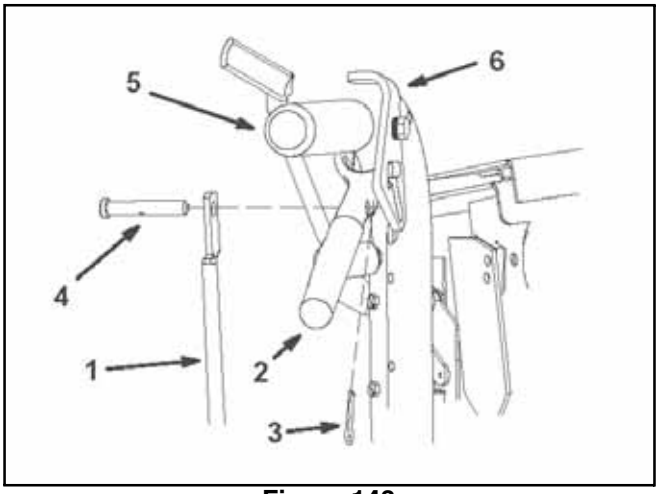


Figure 143 m-7669

(1) Control rod	(4) Clevis pin
(2) Drive lever	(5) Handle
(3) Hairpin cotter	(6) Neutral/parking brake lock

4. Loosen the turn buckle wing nut (Figure 144).

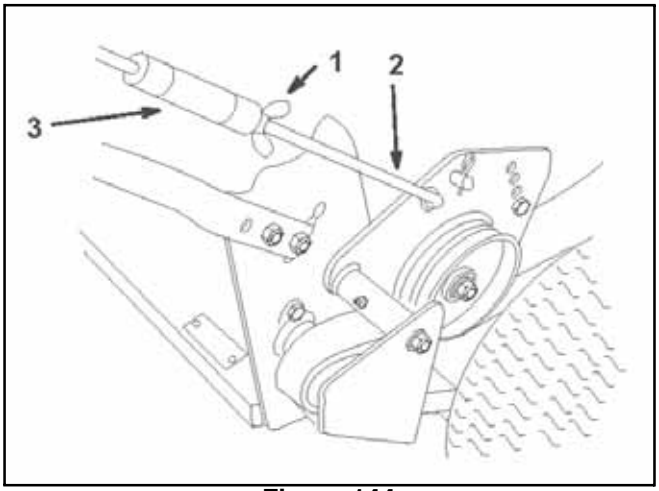


Figure 144 m-6592-2

(1) Turnbuckle	(3) Control rod
(2) Wing nut	

5. Adjust the control rod length by rotating the turnbuckle until there is 3/16 to 1/4 inch (5 to 6mm) clearance between the control rod end and the bottom of the neutral/parking brake lock slot with the drive lever in the drive position (Figure 145).

6. Tighten the wing nut to prevent the turnbuckle from turning (Figure 144).

7. Check the drive adjustment by squeezing the drive levers firmly and then releasing. If the 3/16 to 1/4 inch (5 to 6mm) adjustment has changed, adjust as necessary.

8. Check the parking brake. Refer to ”Brake Service" on page 4 - 3.

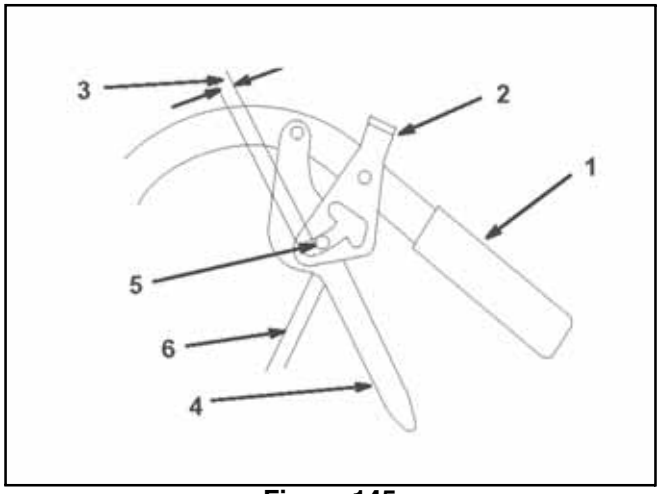


Figure 145

(1) Handle	(4) Drive lever
(2) Neutral/Parking brake lock	(5) Drive position
(3) 3/16 inch to 1/4 inch (5mm to 6mm clearance)	(6) Control rod

Setting Up the Frame (Floating Deck)

Checking Carrier Frame and Deck Alignment

1. Stop the engine, remove the key and disconnect the spark plug wire(s) from the spark plug(s).
2. Place a long straight edge on top of the engine deck as shown in Figure 146.
3. At the carrier frame cross tube, measure location A height (Figure 146). This measurement must be 2-13/16 in. (71mm), plus or minus 1/4 in. (6mm).
4. If the height at location A is not correct, adjustment is needed.
5. Loosen the carrier frame mounting bolts on both sides of the machine (Figure 146).
6. Align the carrier frame and engine deck to obtain 2-13/16 in. (71mm), plus or minus 1/4 in. (6mm) at location **A** (Figure 146).
7. Tighten the carrier frame mounting bolts on both sides of the machine (Figure 146).

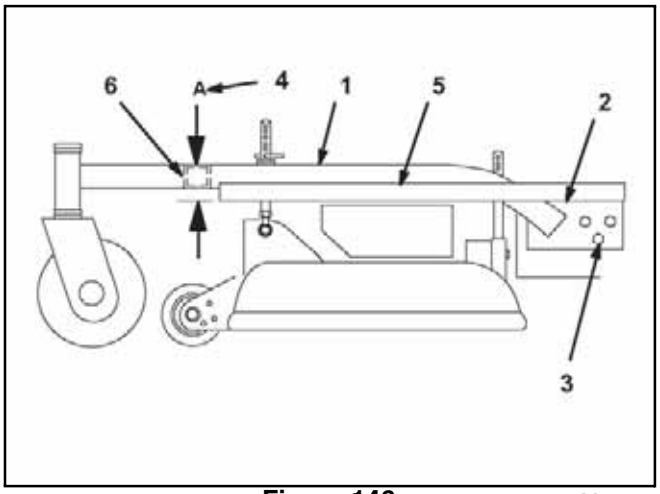


Figure 146 M-5315

(1) Carrier frame (2) Top of engine deck (3) Carrier frame mounting bolts	(4) Location A, 2-13/16 in. (71mm)± 1/4 in. (6mm) (5) Straight edge (6) Carrier frame cross tube

Checking Engine Deck Height (Floating Deck)

1. Stop the engine, remove the key and disconnect the spark plug wire(s) from the spark plug(s).
2. Adjust the tire pressure in all tires to specifications.
3. Measure engine deck height at location **A** (Figure 147).
4. Measure engine deck height at location **B** (Figure 147).
5. If the height at location **A** and **B** are not the same, change tire pressure slightly to make them the same.

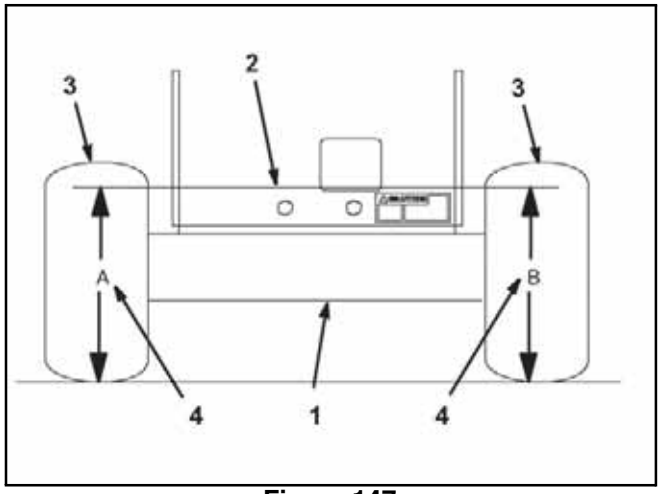


Figure 147 m-5237

(1) Back view of machine (2) Top of engine deck (3) Tires	(4) Same height at locations A and B

Checking Carrier Frame Side-to-Side

1. Stop the engine, remove the key and disconnect the spark plug wire(s) from the spark plug(s).
2. Adjust the tire pressure in all tires to specifications.
3. Measure carrier frame height at location **A** (Figure 148).
4. Measure carrier frame height at location **B** (Figure 148).

5. If the carrier frame height is not the same, move spacers from top or bottom of caster wheel, to make it level. The tire pressure may also be adjusted slightly to make it level.

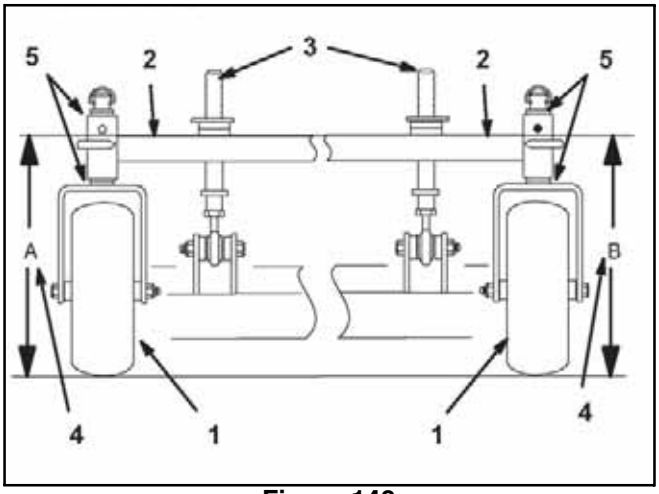


Figure 148 m-5231

(1) Caster wheel	(4) Same height at locations A and B
(2) Carrier frame	
(3) Front height-of-cut pins	(5) Caster spacers

Checking Carrier Frame Front-to-Rear Pitch (Floating Deck)

The carrier frame must have a pitch of 1/4 in. (6mm) over the length of 24 inches (6.1cm) on the carrier frame.

1. Measure out 24 inches (6.1cm) on the carrier frame (Figure 149).

2. Measure carrier frame height at location **A** (Figure 149).

3. Measure carrier frame height at location **B** (Figure 149).

4. The height at location **A** must be 1/4-3/8 in. (6mm - 10mm) lower than location **B** (Figure 149).

5. If the carrier frame is not correct, move caster spacers from top or bottom to make the correct pitch.

6. The tire pressure may also be adjusted slightly to achieve the correct pitch.

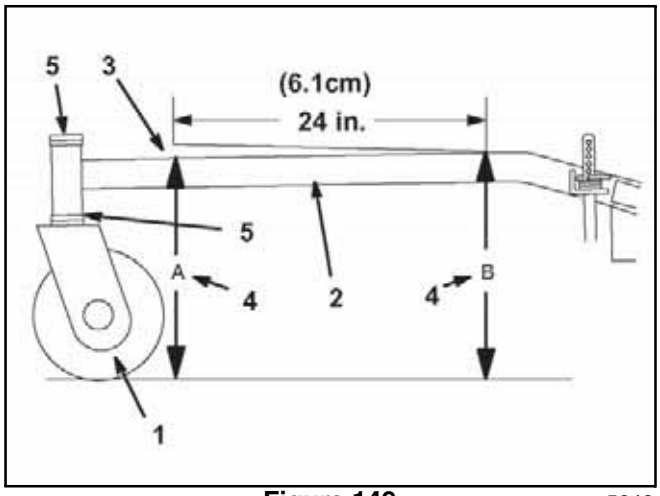


Figure 149 m-5242

(1) Caster wheel	(4) Height at locations A and B
(2) Carrier frame	
(3) 1/4-3/8 in. (6mm - 10mm) pitch over 24 in. (6.1 cm) length	(5) Caster spacers

Checking the Deck Level Side-to-Side (Floating Deck)

1. Adjust the tire pressure in all tires to specifications.

2. Position the blades side-to-side (Figure 150). Measure at **A** and **B** locations (Figure 150) from a level surface to the cutting edge of blade tips (Figure 151).

3. The difference between measurements **A** and **B** should be no more than 1/4 in. (6mm).

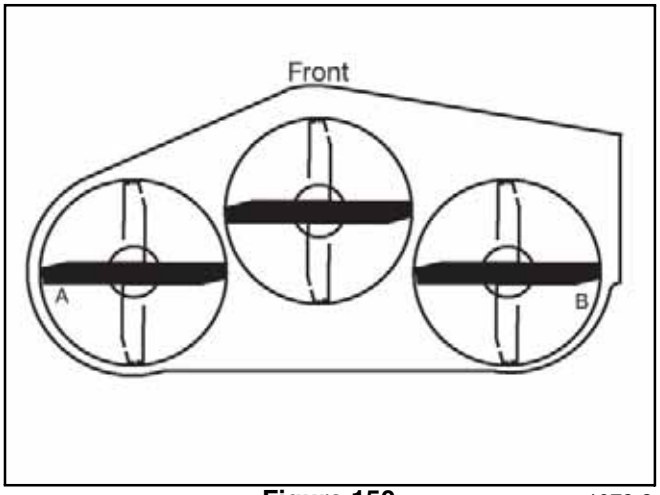


Figure 150 m-1078-3

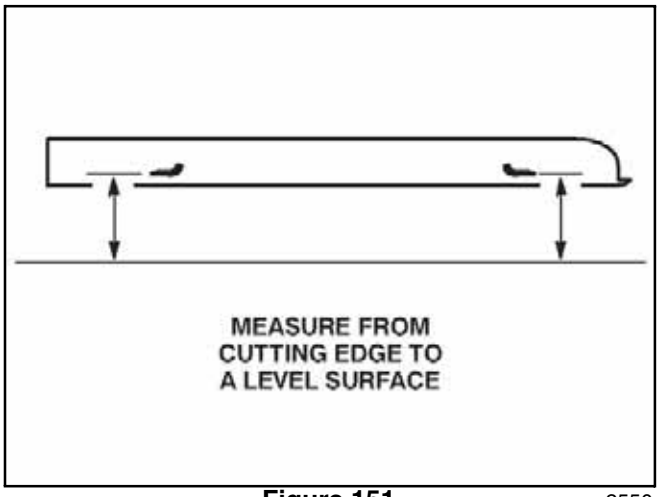


Figure 151 m-2550

Checking the Deck Front-to-Rear Blade Slope (Floating Deck)

1. Adjust the tire pressure in all tires to specifications.

2. Position one blade front-to-rear (Figure 152). Measure at **C** and **D** locations (Figure 152) from a level surface to the cutting edge of the blade tips (Figure 153).

3. **The mower blade should be 1/4 in. (6mm) lower in front *C* than in the rear *D*.** Rotate blades and repeat for other blades. If it is not correct, proceed to "Adjusting the Deck Front-to-Rear Blade Slope" on page 7 - 3.

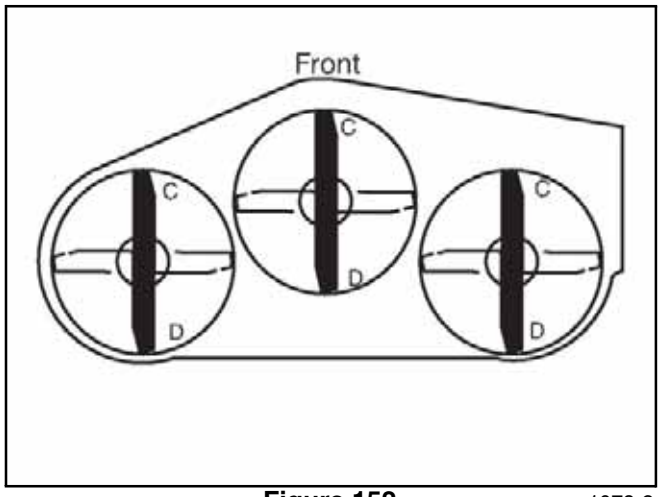


Figure 152 m-1078-2

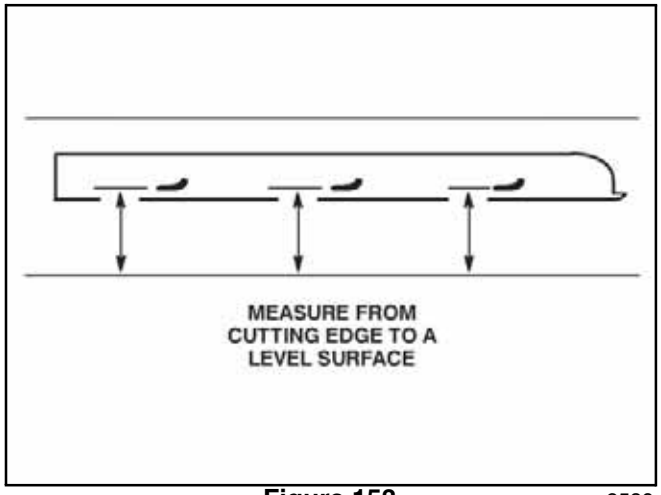


Figure 153 m-2539

Adjusting the Deck Front-to-Rear Blade Slope

1. Change the front-to-rear pitch by adjusting the front height-of-cut posts (Figure 154).

2. To raise the front of the deck, loosen jam nut and rotate the front pin clockwise (Figure 154).

3. To lower the front of the deck, loosen jam nut and rotate the front pin counter clockwise (Figure 154).

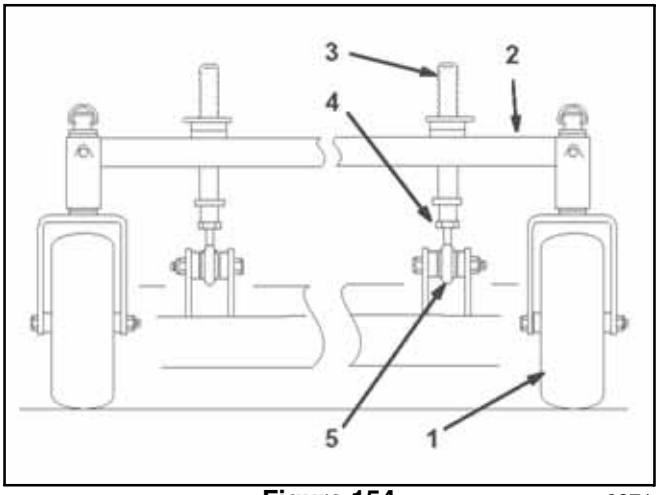


Figure 154 m-6371

(1) Caster wheel	(4) Jam nut
(2) Carrier frame	(5) Ball joint
(3) Front height-of-cut pins	

4. Position the blades front-to-rear (Figure 152). Measure at **C** and **D** locations (Figure 152) from a level surface to the cutting edge of the blades (Figure 153).

5. Check the side-to-side leveling of the cutting unit.

Adjusting the Side-to-Side Level (Fixed Deck)

1. Changing the side-to-side level is done by adjusting tire pressure.

2. After leveling side-to-side, check front-to-rear pitch.

Matching Height-of-Cut (Fixed Deck)

1. Make this adjustment after the mower has been leveled side-to-side and the pitch has been set.

2. Set the height-of-cut to the 4 in. (102mm) position following the height-of-cut decal.

3. With the machine on level surface, position one blade front-to-rear (Figure 155). Measure at **A** and from level surface to the cutting edge of the blade tips (Figure 156).

4. The measurement should be 4 in. (102mm).

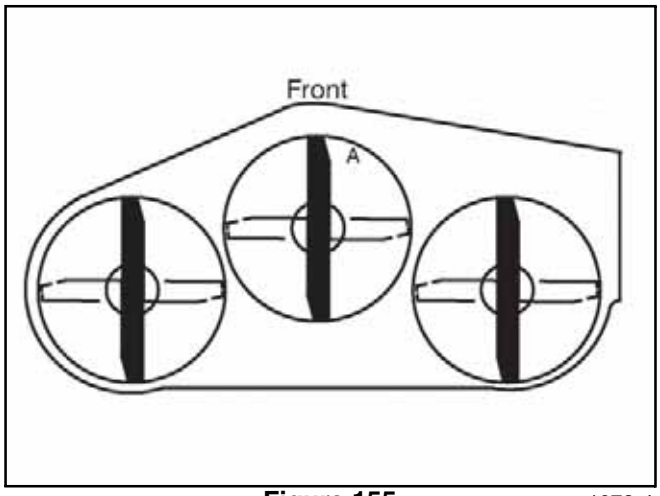


Figure 155 m-1078-4

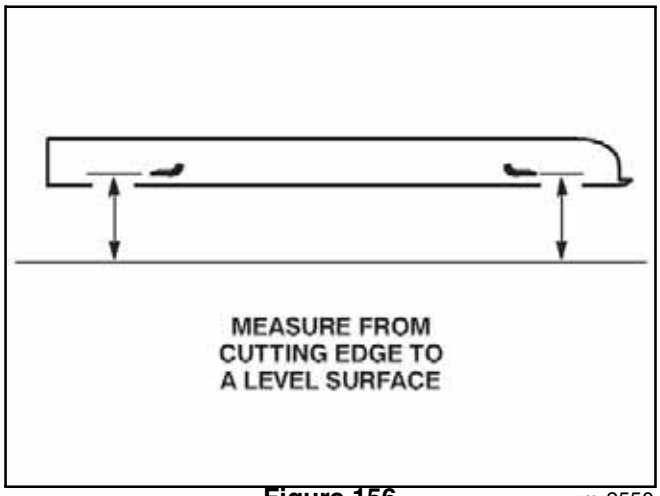


Figure 156 m-2550

5. If it does not measure correctly, add or remove air pressure equally in all tires to adjust height-of-cut.

Replacing the Mower Belt (Floating Deck) 36 in. (91cm)

Squealing when the belt is rotating, blades slipping when cutting grass, frayed belt edges, burn marks and cracks are signs of a worn deck belt. Replace the deck belt if any of these conditions are evident.

1. Disengage the PTO and set the parking brake.
2. Stop the engine, remove the key, and wait for all moving parts to stop before leaving the operating position.
3. Remove the knobs/rubber washers holding the carrier frame cover and remove the carrier frame cover.
4. Remove the knobs/rubber washers holding the belt cover to the cutting unit and remove the belt cover.
5. Remove the PTO drive belt. Refer to "Replacing the PTO Drive Belt (Floating Deck) 36 in. (91cm)" on page 7 - 5.
6. Disconnect the idler arm spring to relieve tension on the idler arm and idler pulley, then remove the worn mower belt (Figure 157).
7. Install the new mower belt around the outward spindle pulley, the idler pulley, and in the lower groove of the double spindle pulley (Figure 157).
8. Reconnect the idler arm spring (Figure 157).
9. Install the PTO drive belt. Refer to "Replacing the PTO Drive Belt (Floating Deck) 36 in. (91cm)" on page 7 - 5.
10. Reinstall the belt cover onto the cutting unit, then reinstall and tighten the knobs/rubber washers.
11. Install the carrier frame cover onto the cutting unit, then install and tighten the knobs/rubber washers.

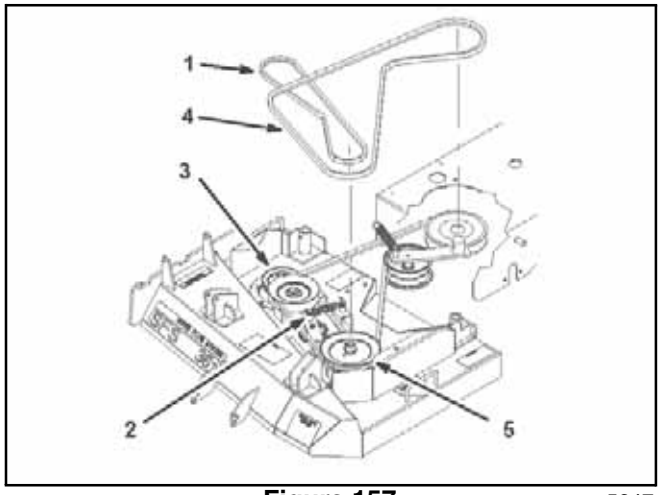


Figure 157 m-5247

(1) Mower belt	(4) PTO drive belt
(2) Idler arm spring	(5) Double spindle pulley
(3) Outward pulley	

Replacing the PTO Drive Belt (Floating Deck) 36 in. (91cm)

Squealing when the belt is rotating, blades slipping when cutting grass, frayed belt edges, burn marks and cracks are signs of a worn drive belt. Replace the drive belt if any of these conditions are evident.

1. Disengage the PTO and set the parking brake.
2. Stop the engine, remove the key, and wait for all moving parts to stop before leaving the operating position.
3. Remove the knobs/rubber washers holding the carrier frame cover and remove the carrier frame cover.
4. Remove the knobs/rubber washers holding the belt covers to the top of the cutting unit and remove the belt covers.
5. Remove the heat shield from the engine deck and carrier frame.
6. Remove the idler spring from idler arm. Remove the drive belt from the PTO clutch pulley, idler pulleys and the left spindle pulley (Figure 158).

7. Install the new drive belt onto the PTO engagement pulley and the top groove of the center spindle pulley (Figure 158).

8. Install belt onto idler pulleys and then install idler spring (Figure 158).

9. Install the heat shield to the engine deck and carrier frame.

10. Reinstall the belt covers onto the cutting unit, then reinstall and tighten the knobs/rubber washers.

11. Reinstall the carrier frame cover onto the cutting unit, then reinstall and tighten the knobs/rubber washers.

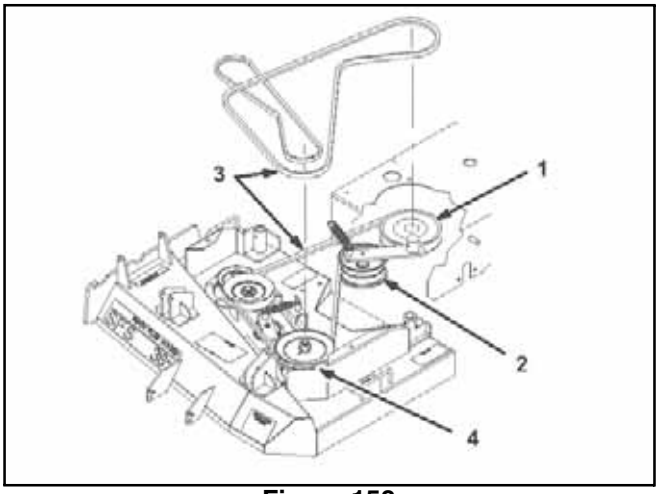


Figure 158

(1) PTO clutch pulley	(3) Drive belt
(2) Drive belt idler	(4) Double spindle pulley

Replacing the Deck Belt (Floating Deck) 44 & 52 in. (111 & 132cm)

Squealing when the belt is rotating, blades slipping when cutting grass, frayed belt edges, burn marks and cracks are signs of a worn deck belt. Replace the deck belt if any of these conditions are evident.

1. Stop the engine, remove the key and disconnect the spark plug wire(s) from the spark plug(s).

2. Remove the knobs holding the carrier frame cover and remove the carrier frame cover.

3. Remove the knobs holding the belt covers to the cutting unit and remove the belt covers.

4. Remove the PTO drive belt. Refer to "Replacing the PTO Drive Belt (Floating Deck) 44 & 52 in. (111 & 132cm)" on page 7 - 7.

5. Disconnect the idler arm spring to relieve tension on the idler arm and idler pulley, then remove the worn deck belt (Figure 159).

6. Install the new deck belt around the two outside spindle pulleys, the idler pulley, and in the lower groove of the center spindle pulley (Figure 159).

7. Connect the idler arm spring (Figure 159).

8. Reinstall the PTO drive belt. Refer to "Replacing the PTO Drive Belt (Floating Deck) 44 & 52 in. (111 & 132cm)" on page 7 - 7.

9. Adjust deck belt guide to 1/8 in. (3mm) from belt (Figure 159).

10. Reinstall the deck covers onto the cutting unit, then reinstall and tighten the knobs.

11. Install the carrier frame cover onto the cutting unit, then install and tighten the hand knobs.

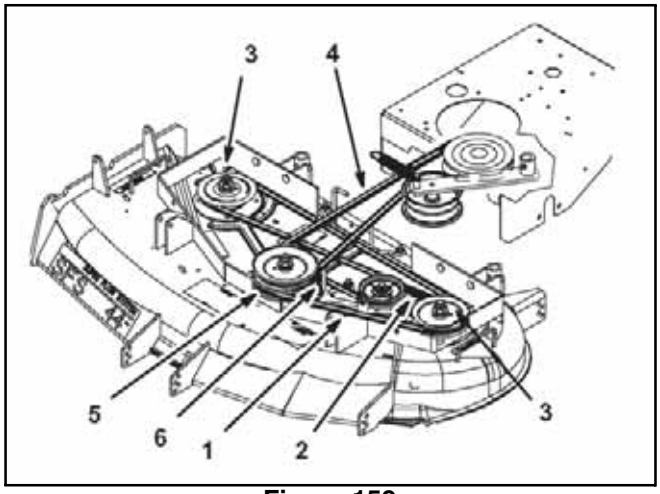


Figure 159 m-5194-2

(1) Deck belt	(4) PTO drive belt
(2) Idler arm spring	(5) Center spindle pulley
(3) Outward pulley	(6) Deck belt guide

Replacing the PTO Drive Belt (Floating Deck) 44 & 52 in. (111 & 132cm)

Squealing when the belt is rotating, blades slipping when cutting grass, frayed belt edges, burn marks and cracks are signs of a worn drive belt. Replace the drive belt if any of these conditions are evident.

1. Stop the engine, remove the key and disconnect the spark plug wire(s) from the spark plug(s).
2. Remove the knobs holding the carrier frame cover and remove the carrier frame cover.
3. Remove the knobs holding the belt covers to the top of the cutting unit and remove the belt covers.
4. Remove the idler spring from idler arm.
5. Remove the drive belt from the PTO engagement pulley and the center spindle pulley (Figure 160).
6. Remove the worn drive belt (Figure 160).
7. Install the new drive belt onto the PTO engagement pulley and the top groove of the center spindle pulley (Figure 160).
8. Install belt onto idler pulley and then install idler spring (Figure 160).
9. Adjust PTO drive belt guide to 1/8 in. (3mm) from belt (Figure 160).
10. Install the belt covers onto the cutting unit, then install and tighten the knobs.
11. Install the carrier frame cover onto the cutting unit, then install and tighten the hand knobs.

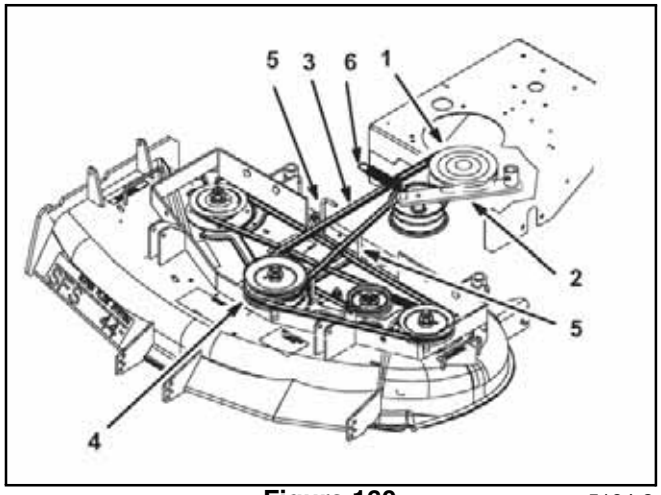


Figure 160 m-5194-3

(1) PTO engagement pulley	(4) Center spindle pulley
(2) PTO drive belt idler	(5) PTO drive belt guide
(3) PTO drive belt	(6) Idler spring

Mower Deck Belt Replacement (Fixed Deck Models)

1. Stop the engine and remove the spark plug wires.
2. Disengage the PTO and remove the deck cover.
3. Remove the belt from the front idler pulley (Figure 161).

Figure 161 0616-02

4. Loosen the belt guide for the rear idler (Figure 162).

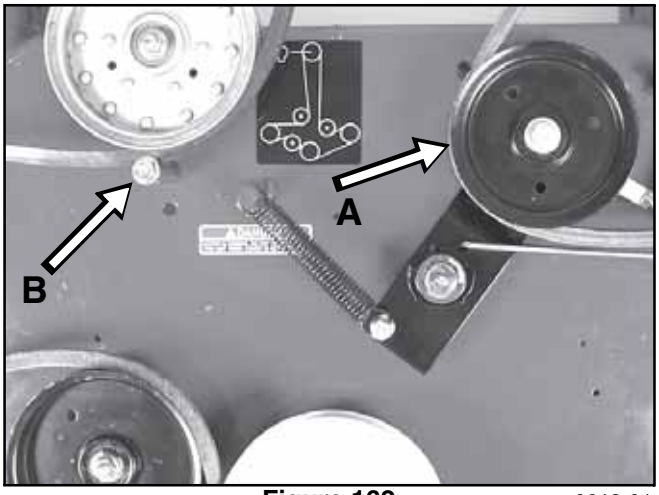


Figure 162 0618-01

(A) Engagement pulley	(B) Belt guide

5. Remove the deck engagement pulley (Figure 162).

6. Route the new belt as shown on the diagram located on the deck (Figure 163).

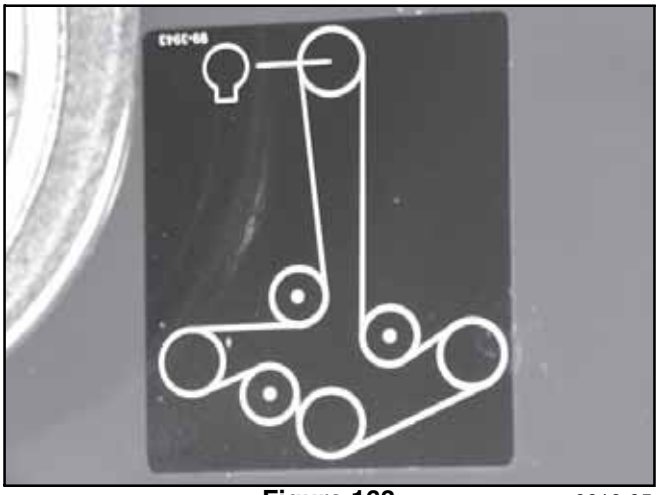


Figure 163 0616-05

7. Reverse steps 1 - 5 to complete the installation.

Mower Deck Belt Guide Adjustment (Fixed Deck Models)

1. Stop the engine and remove the spark plug wire(s).

2. Engage PTO.

3. Measure the clearance between the drive belt and guide located under the frame (Figure 164).

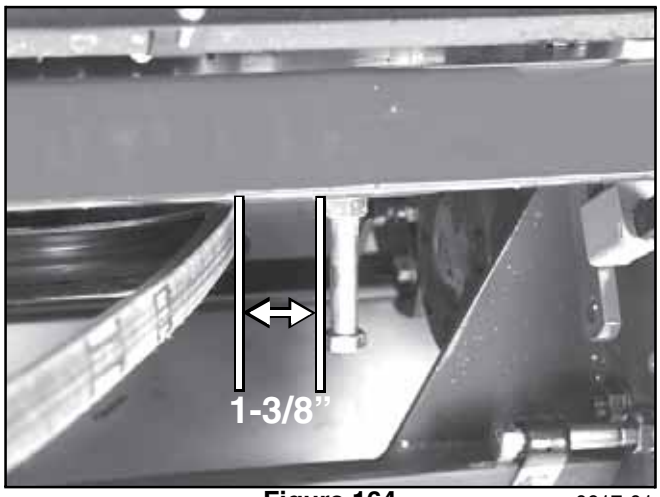


Figure 164 0617-01

4. Loosen the guide mounting bolt and adjust the guide to obtain 1-3/8” (35mm) clearance.

Replacing the Mower Belt (Fixed Deck Gear Drive) 36 in. (91cm)

1. Disengage the blade control (PTO) lever and set the parking brake.

2. Stop the engine and wait for all moving parts to stop before leaving the operating position.

3. Remove the knobs and the belt cover on the mower.

4. Remove the idler pulley and the belt (Figure 165).

5. Install the new mower belt.

6. Install the idler pulley.

7. Engage the blade control (PTO) lever and check the belt tension. Refer to "Adjusting Mower Belt Tension (Fixed Deck) - All" on page 7 - 16.

Note: Mower belt tension is 10 - 15 ft. lb. 14 - 20 N-m) with the belt deflected 1/2 in. (13mm) halfway between the pulleys (Figure 165).

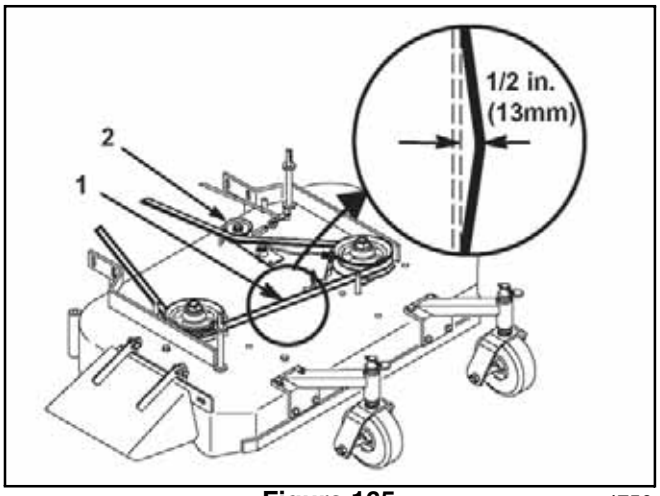


Figure 165 m-4750

(1) Mower belt with 1/2 in. (13mm) deflection	(2) Idler pulley

8. Check the clearance between the bell crank and the transmission output shaft (Figure 166).

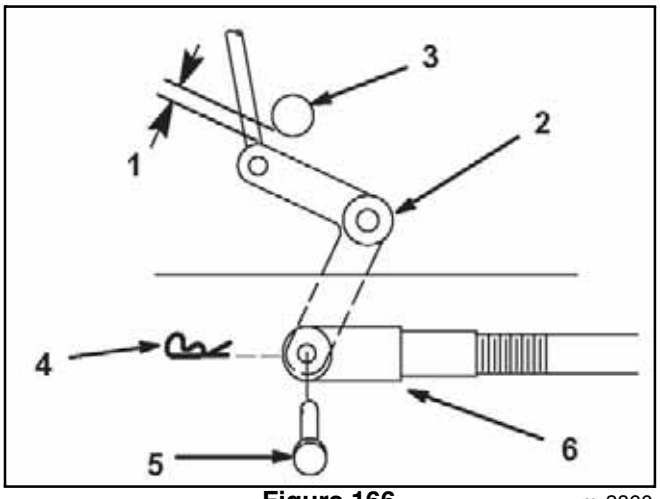


Figure 166 m-3860

(1) 1/16 - 1/8 in. (2 - 3mm)	(4) Hairpin cotter
(2) Bell crank	(5) Clevis pin
(3) Transmission output shaft	(6) Clevis

Note: The clearance should be 1/16 - 1/8 in. (2 - 3mm). Adjust clevis as needed to achieve specified clearance.

Replacing the Mower Belt (Fixed Deck) 32 in. (81cm)

1. Disengage the blade control (PTO) lever and set the parking brakes.
2. Stop the engine and wait for all moving parts to stop before leaving the operating position.
3. Remove the knobs and the belt cover on the mower.
4. Remove the idler pulley and the worn belt (Figure 167).
5. Install the new mower belt.
6. Install the idler pulley.
7. Engage the blade control (PTO) lever and check the belt tension. Refer to "Adjusting Mower Belt Tension (Fixed Deck) - All" on page 7 - 16.

Note: The proper mower belt tension is 10 - 15 lbs. (44 - 67 N-m) with the belt deflected 1/2 inch (13mm) halfway between the pulleys (Figure 167).

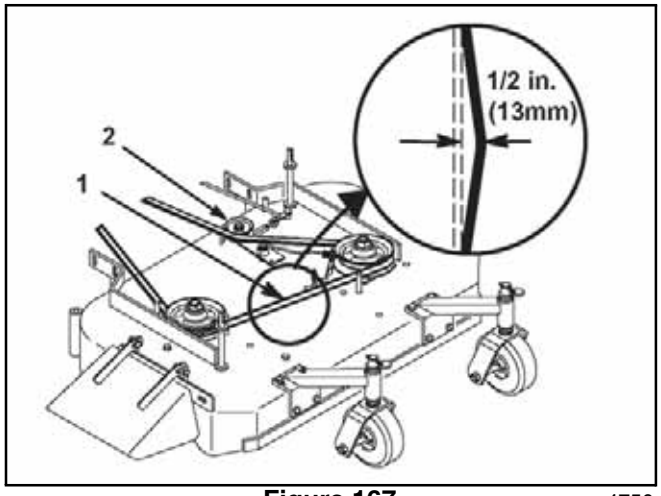


Figure 167 m-4750

(1) Mower belt with 1/2 inch (13mm) deflection	(2) Idler pulley

8. Engage the blade control (PTO) lever.

9. Check the clearance between the bell crank and the transmission output shaft (Figure 168).

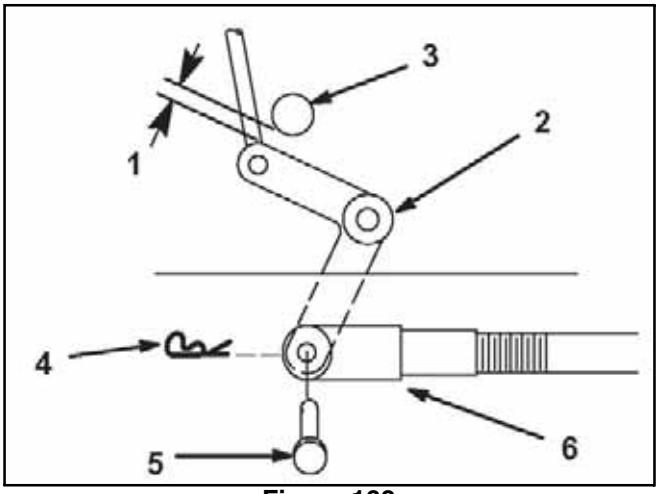


Figure 168 m-3860

(1) 1/16 - 1/8 inch (2 - 3mm)	(4) Hairpin cotter
(2) Bell crank	(5) Clevis pin
(3) Transmission output shaft	(6) Clevis

Note: The clearance should be 1/16 - 1/8 inch (2 - 3mm).

10. Remove the hairpin cotter and the clevis pin from the bell crank.

11. Rotate the clevis clockwise on the rod to increase the clearance; rotate it counterclockwise to decrease it (Figure 168).

12. Disengage the blade control (PTO) lever.

Note: If the assist arm does not contact the front stop on the mower deck (Figure 169), adjust the clevis to bring the bell crank closer to the transmission output shaft (Figure 168).

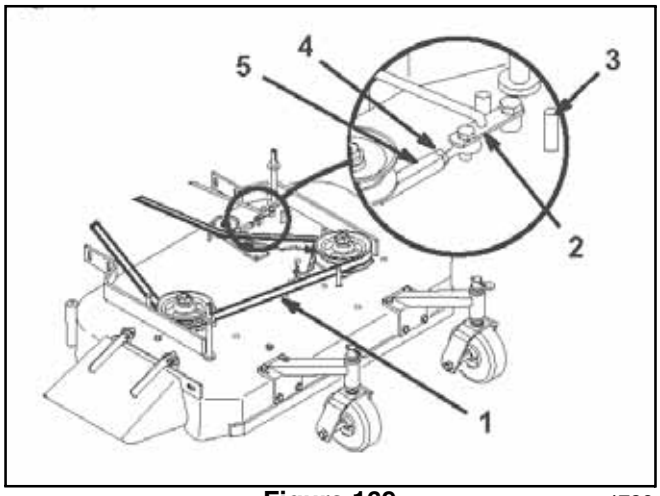


Figure 169 m-4739

(1) 1/2 inch (13mm) deflection here	(3) Front stop
(2) Assist arm	(4) Locknut
	(5) Turnbuckle

13. Check the belt guide under the engine frame for the proper adjustment (Figure 164).

Replacing the Mower Belt (Fixed Deck Gear Drive) 48 in. (122cm)

1. Disengage the power take off (PTO), set the parking brake, and turn the ignition key to “OFF” to stop the engine. Remove the key and spark plug wire.

2. Remove the knobs and belt cover on mower.

3. Remove idler pulley and then remove belt (Figure 170).

4. Install new belt.

5. Install idler pulley.

6. Engage PTO and check belt tension. Refer to "Adjusting Mower Belt Tension (Fixed Deck) - All" on page 7 - 16.

Note: Proper belt tension is 10 - 15 lbs. (14 - 20 N-m) with the belt deflected 1/2” (13mm) halfway between pulleys (Figure 170).

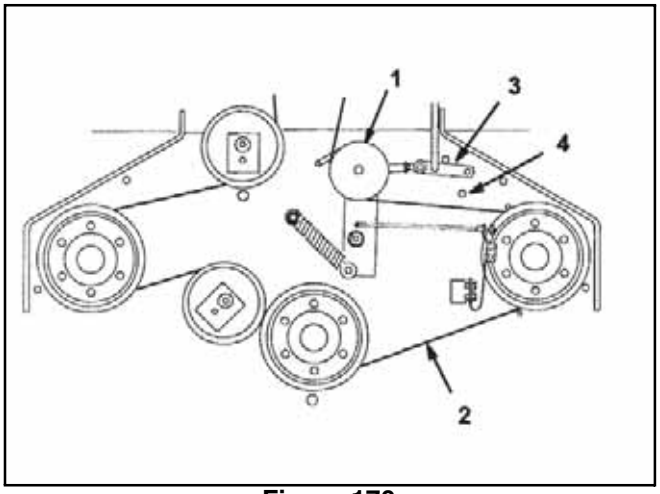


Figure 170 m-4731-2

(1) Idler pulley	(3) Assist arm
(2) 1/2” (13mm) deflection here	(4) Front stop

7. Engage PTO lever and check the clearance between the bell crank and the transmission output shaft (Figure 171). Space should be 1/16” - 1/8” (2 - 3mm).

8. Remove hairpin cotter and clevis pin from bell crank. Rotate clevis clockwise on rod to increase or counterclockwise to decrease clearance (Figure 171).

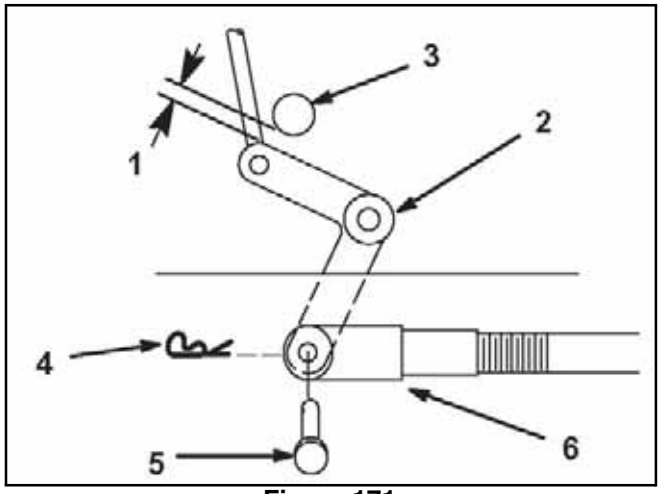


Figure 171 m-3860

(1) 1/16” - 1/8” (2 - 3mm)	(4) Hairpin cotter
(2) Bell crank	(5) Clevis pin
(3) Transmission output shaft	(6) Clevis

9. Disengage the PTO. If the assist arm does not contact the front stop on the mower deck (Figure 170), readjust the clevis to bring the bell crank closer to the transmission output shaft (Figure 171).

10. Check the belt guide under the engine frame for proper adjustment (Figure 172). The distance between the belt guide and mower belt should be 1-3/8” (35mm). Adjust as necessary. The disengaged belt should not drag or fall off pulley when guides are properly adjusted.

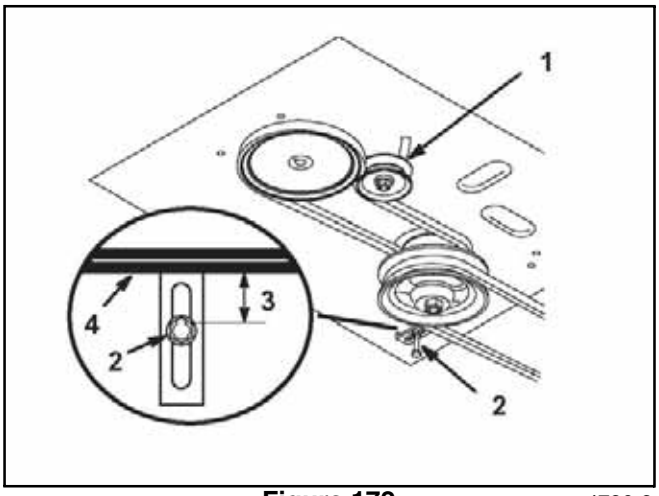


Figure 172 m-4726-2

(1) Idler in slot	(3) 1-3/8” (35mm)
(2) Belt guide	(4) Mower belt

Mower Deck Drive Belt Adjustment (Fixed Deck Models)

1. Stop the engine and remove the spark plug wire(s).
2. Remove the deck cover.
3. Engage the PTO.
4. Check the belt guide adjustment as described above.
5. Check the belt tension midway between the front and left spindle pulleys. It should require approximately 10 lbs. force to deflect the belt 1/2” (13mm).

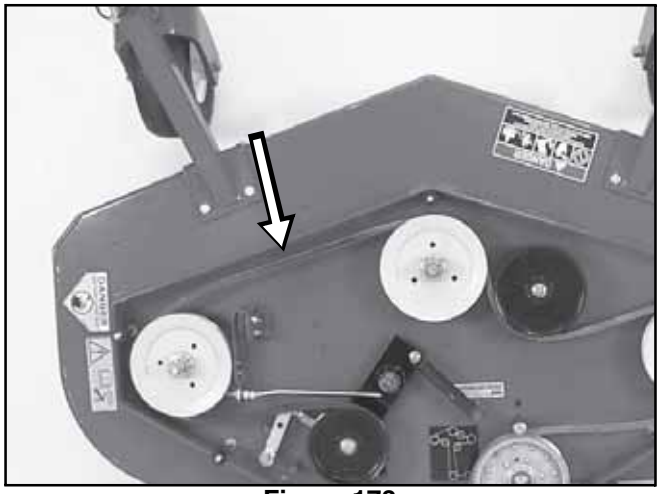


Figure 173 0617-08

6. To adjust the belt tension, loosen the locknut on the turnbuckle under the engagement pulley (Figure 174). Rotate the turnbuckle to tighten or loosen the belt.

Caution: There must be a minimum of .31 inch (8mm) thread engagement in the turnbuckle.

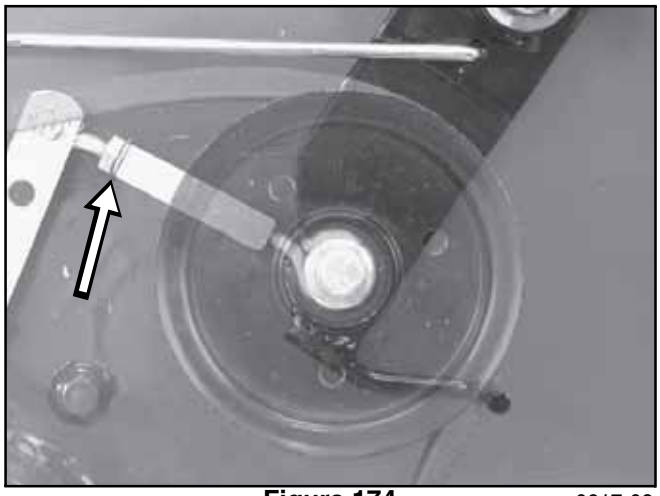


Figure 174 0617-09

7. If you cannot obtain the correct belt tension while maintaining the minimum thread engagement, move the rear idler pulley and guide to the forward position on the deck (Figure 175).

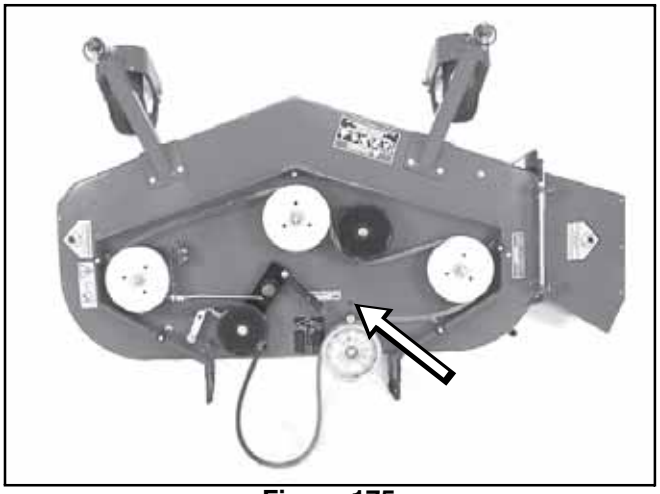


Figure 175 0616-10

Blade Engagement Adjustment (Fixed Deck)

1. Stop the engine and remove the spark plug wires.
2. Engage the PTO.
3. Check the clearance between the PTO bellcrank (under frame) and the axle support gusset (Figure 176). The bellcrank should just clear the gusset.

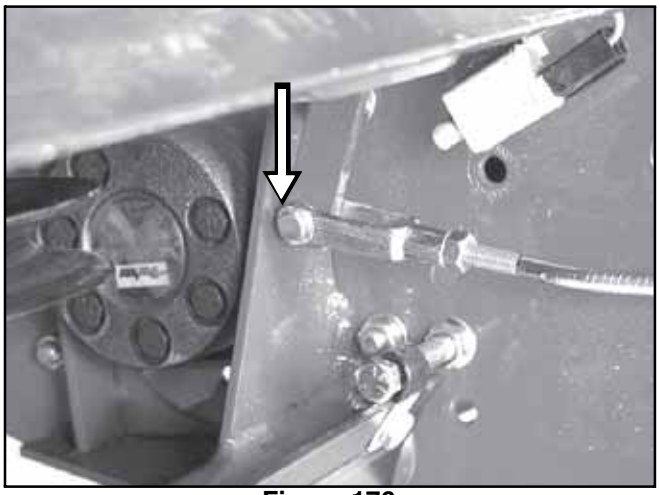


Figure 176 0617-04

4. Check the location of the assist arm. The assist arm should contact the rear stop on the deck (Figure 177).

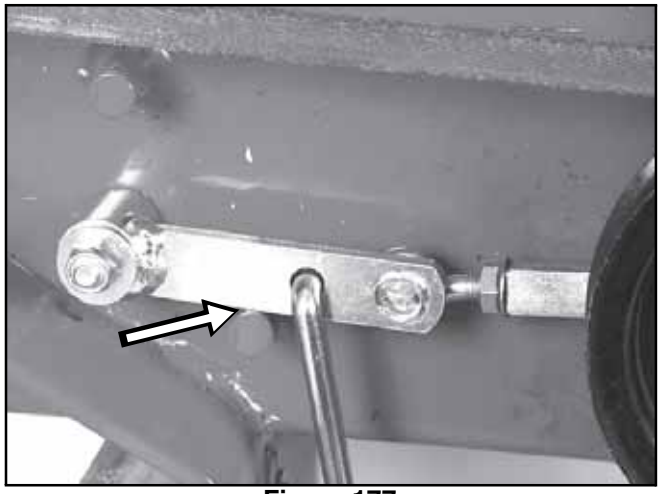


Figure 177 0617-02

5. Disengage the PTO. The assist arm should contact the front stop on the deck (Figure 178).

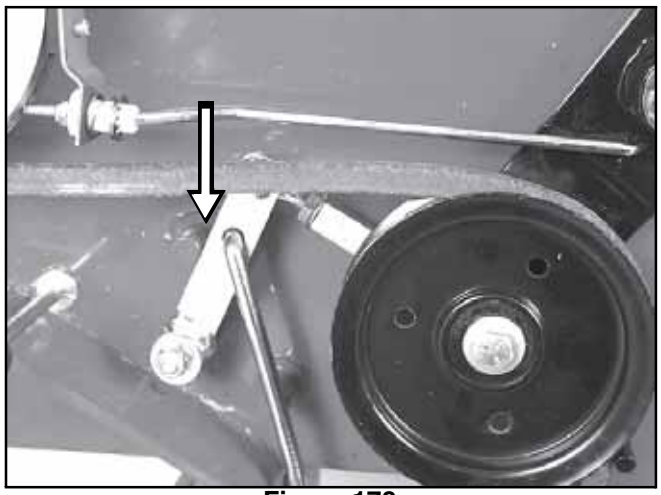


Figure 178 0607-06

6. If adjustment is necessary, loosen the locknut on the clevis. Remove the pin and turn the clevis to adjust the length of the linkage.

Blade Safety Switch Adjustment (Fixed Deck)

1. Stop the engine and remove the spark plug wires.

2. Disengage the PTO so that the bellcrank is touching the rear of the slot in the frame (Figure 179).

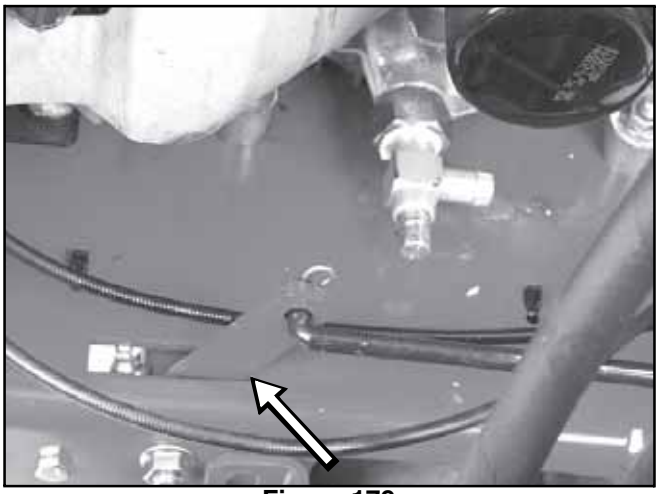


Figure 179 0617-03

3. Loosen the safety switch mounting bracket and adjust the switch until the bellcrank depresses the switch plunger 1/4” (6mm) (Figure 180). Make sure the bellcrank **DOES NOT** contact the switch body or damage to the switch will occur.

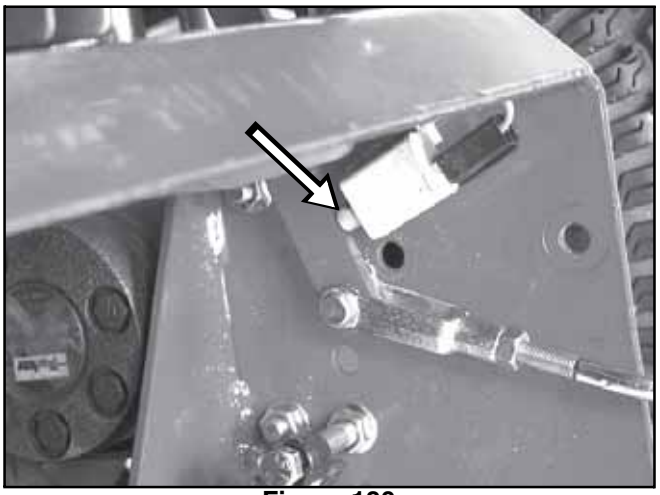


Figure 180 0617-05

4. Tighten the safety switch mounting bracket.

Adjusting the Blade Brake (Fixed Deck)

1. Disengage the PTO and set the parking brake.

2. Stop the engine and wait for all moving parts to stop before leaving the operating position.

3. If necessary, adjust the spring mounting bolts so that the blade brake pad rubs against the pulley edges (Figure 181).

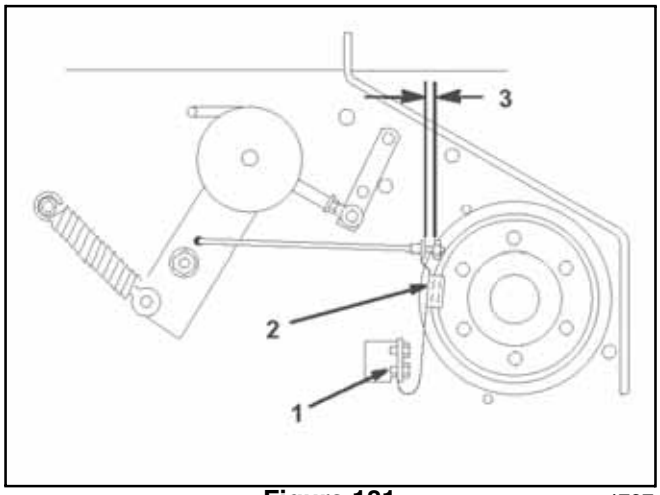


Figure 181 m-4727

(1) Spring mounting bolts (2) Blade brake pad	(3) 1/8 - 3/16 inch (3 - 5mm)

4. Adjust the nut at the end of the blade brake rod until there is 1/8 - 3/16 inch (3 - 5mm) between the nut and the spacer (Figure 181).

5. Engage the blades, and ensure that the blade brake pad no longer contacts the pulley edges.

Replacing the Mower Belt (Fixed Deck Hydro, Pistol Grips)

1. Disengage the PTO, turn the ignition key to off, and remove the key.
2. Wait for all moving parts to stop before leaving the operating position and then chock or block tires.
3. Remove the knobs and the belt cover on the mower.
4. Remove the idler pulley and the belt (Figure 182).
5. Install the new mower belt.
6. Install the idler pulley.
7. Engage the blade control (PTO) lever and check the belt tension. Refer to "Adjusting Mower Belt Tension (Fixed Deck) - All" on page 7 - 16.

Note: Proper belt tension is 10 - 15 ft. lb. (14 - 20 N-m) with the belt deflected 1/2 in. (13mm) halfway between the pulleys (Figure 182).

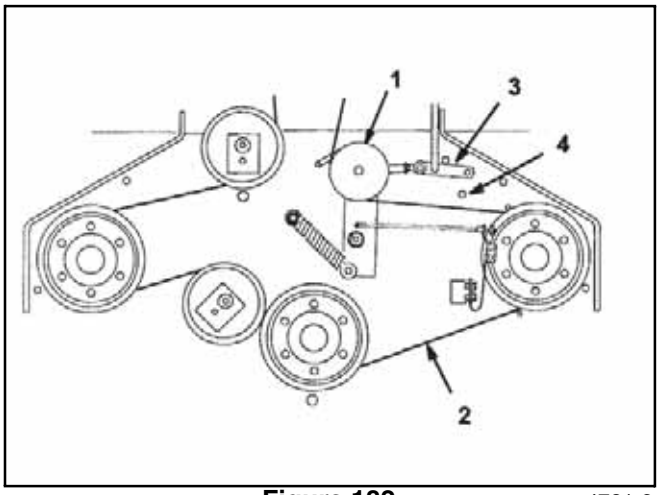


Figure 182 m-4731-2

(1) Idler pulley	(3) Assist arm
(2) 1/2 in. (13mm deflection here)	(4) Front stop

8. Engage the blade control (PTO) lever.
9. Check the clearance between the bell crank and the transmission output shaft (Figure 183).

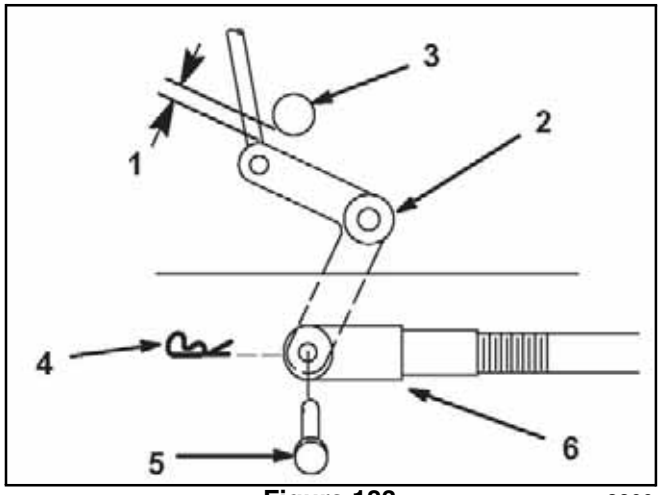


Figure 183 m-3860

(1) 1/16 - 1/8 in (2 - 3mm)	(4) Hairpin cotter
(2) Bell crank	(5) Clevis pin
(3) Transmission output shaft	(6) Clevis

Note: The clearance should be 1/16 - 1/8 in. (2 - 3mm).

10. Remove the hairpin cotter and the clevis pin from the bell crank.
11. Rotate the clevis clockwise on the rod to increase the clearance or counterclockwise to decrease it (Figure 183).

12. Disengage the blade control (PTO) lever.

Note: If the assist arm does not contact the front stop on the mower deck (Figure 184), adjust the clevis to bring the bell crank closer to the transmission output shaft (Figure 183).

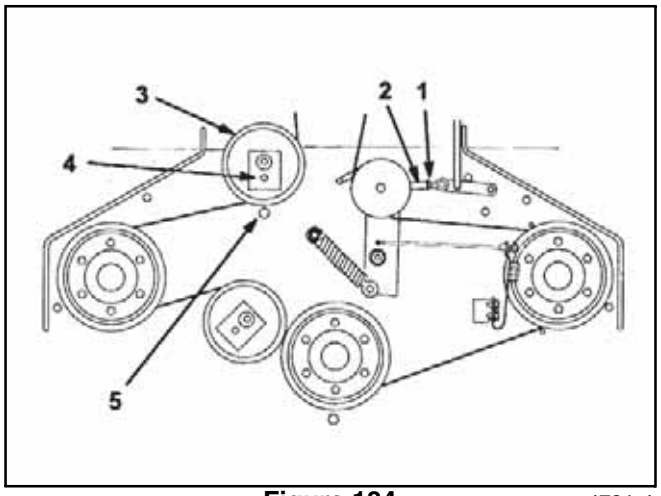


Figure 184 m-4731-4

(1) Locknut	(4) Front position for idler pulley
(2) Turnbuckle	(5) Belt guide
(3) Rear idler pulley	

13. Check the belt guide under the engine frame for proper adjustment (Figure 184).

Note: The distance between the belt guide and the mower belt should be 1-3/8 in. (35mm) when you engage the mower belt (Figure 185). Adjust the mower belt as necessary. The disengaged belt should not drag or fall off the pulley when the guides are properly adjusted.

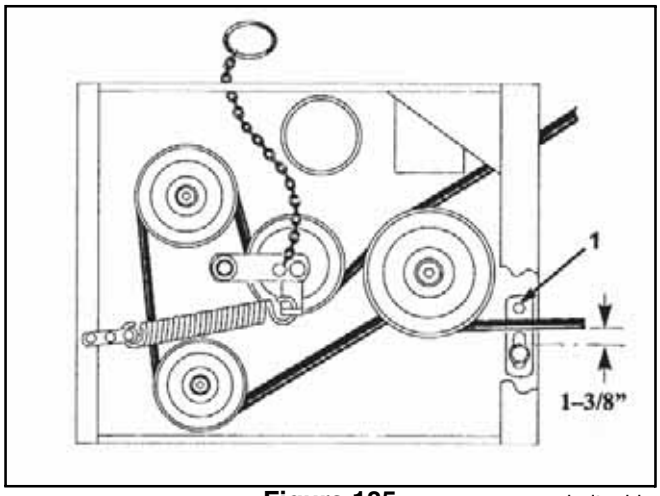


Figure 185 beltguide

(1) Belt guide

Adjusting Mower Belt Tension (Fixed Deck) - All

Service Interval/Specification

Check belt tension after the first hour of operation and at least twice during the first 24 hours of operation.

Important Belt must be tight enough to not slip during heavy loads while cutting grass. Over tensioning will reduce belt and spindle bearing life.

1. Set the parking brake, and turn the ignition key to “OFF” to stop the engine. Remove the key and spark plug wire.

2. Loosen locknut on turnbuckle (Figure 186).

3. Rotate turnbuckle toward rear of mower to increase tension on belt. Rotate turnbuckle toward front of mower to decrease tension on belt (Figure 186).

Note: The eyebolt threads on both ends of the turnbuckle should be engaged a minimum of 5/16” (8mm).

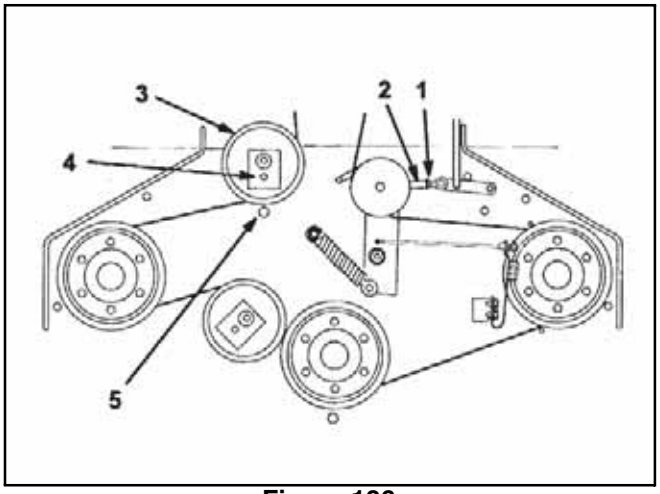


Figure 186 4731-4

(1) Locknut (2) Turnbuckle (3) Rear idler pulley	(4) Front position for pulley (5) Belt guide

4. If the belt is still loose after making adjustments to the turnbuckle, reposition the rear idler pulley to the front hole. The belt guide next to the pulley must also be moved to the front hole (Figure 186).

5. Readjust the turnbuckle.

Servicing the Cutting Blades (All Models)

To ensure a superior quality of cut, keep the blades sharp.

DANGER

A worn or damaged blade can break, and a piece of the blade could be thrown into the operator’s or bystander’s area, resulting in serious personal injury or death.

- **Inspect the blade periodically for wear or damage.**
- **Replace a worn or damaged blade.**

Before Inspecting or Servicing the Blades

Park the machine on a level surface, disengage the blade control (PTO) and set the parking brake. Turn the ignition key to off. Remove the key and disconnect the spark plug wire(s) from the spark plug(s).

Inspecting the Blades

1. Inspect the cutting edges (Figure 187). If the edges are not sharp or have nicks, remove and sharpen the blades. Refer to "Sharpening the Blades" on page 7 - 19.

2. Inspect the blades, especially the curved area (Figure 187). If you notice any damage, wear, or a slot forming in this area (item 3 in Figure 187), immediately install a new blade.

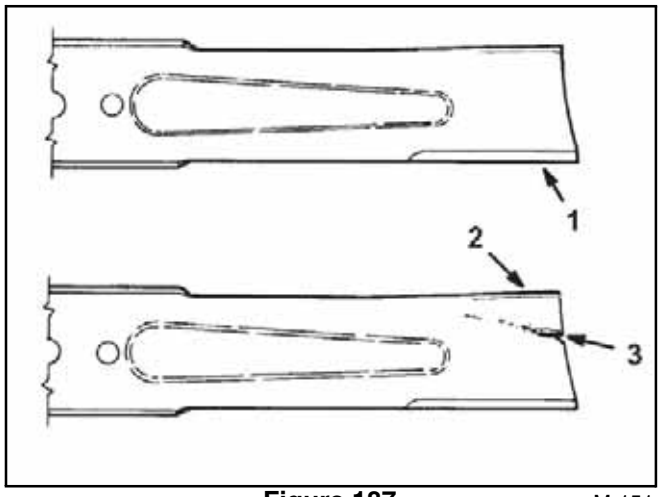


Figure 187 M-151

(1) Cutting edge (2) Curved area	(3) Wear/slot forming

Checking for Bent Blades

1. Rotate the blades until the ends face forward and backward (Figure 188). Measure from a level surface to the cutting edge, position **A**, of the blades (Figure 189). Note this dimension.

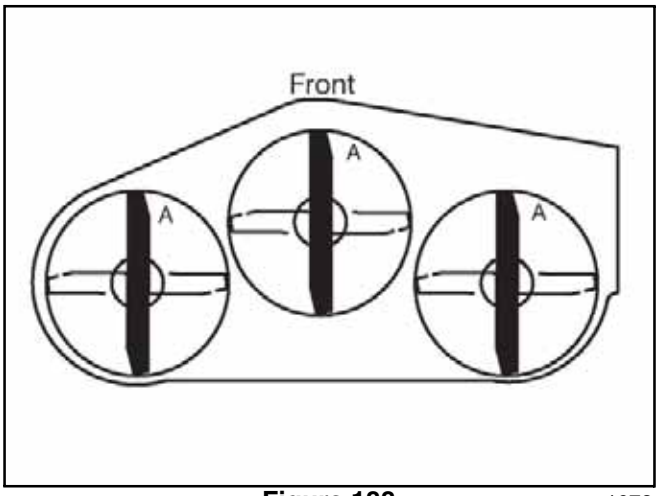


Figure 188 m-1078

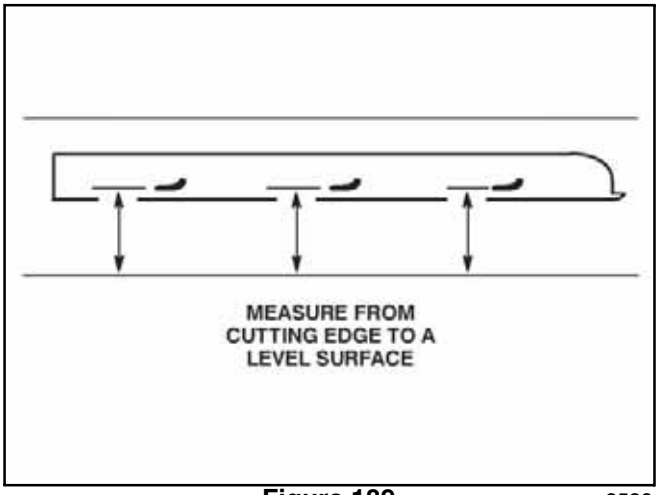


Figure 189 m-2539

2. Rotate the blades 180 degrees so that the opposite ends are forward. Measure from a level surface to the cutting edge of the blades as in step 1 above. The difference between the dimensions must not exceed 1/8 in. (3mm). If this dimension exceeds 1/8 in. (3mm), the blade is bent and must be replaced. Refer to "Removing the Blades" on page 7 - 18, and "Installing the Blades" on page 7 - 19.

WARNING

A blade that is bent or damaged could break apart and could seriously injure or kill you or bystanders.

- **Always replace bent or damaged blade with a new blade.**
- **Never file or create sharp notches in the edges or surfaces of blade.**

Removing the Blades

Blades must be replaced if a solid object is hit, if the blade is out of balance or is bent. To ensure optimum performance and continued safety conformance of the machine, use genuine Toro replacement blades. Replacement blades made by other manufacturers may result in non-conformance with safety standards.

3. Hold the blade end using a rag or thickly-padded glove. Remove the blade bolt, washer, lock washer and blade from the spindle shaft (Figure 190).

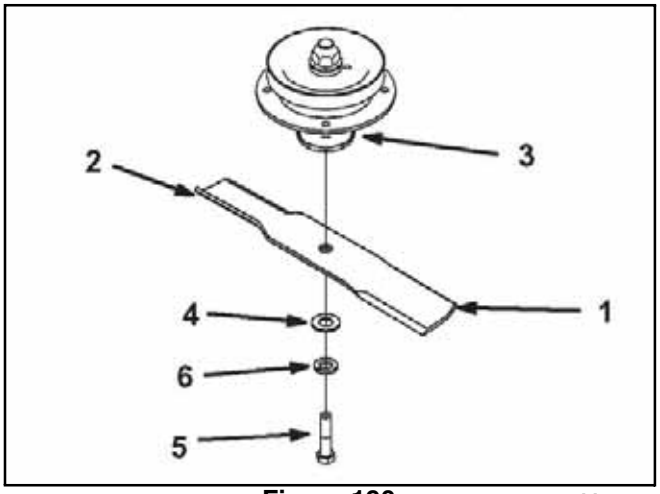


Figure 190 M-5199

(1) Sail area of blade	(4) Washer
(2) Blade	(5) Blade bolt
(3) Blade spindle	(6) Lock washer

Sharpening the Blades

1. Use a file to sharpen the cutting edge at both ends of the blade (Figure 191). Maintain the original angle. The blade retains its balance if the same amount of material is removed from both cutting edges.

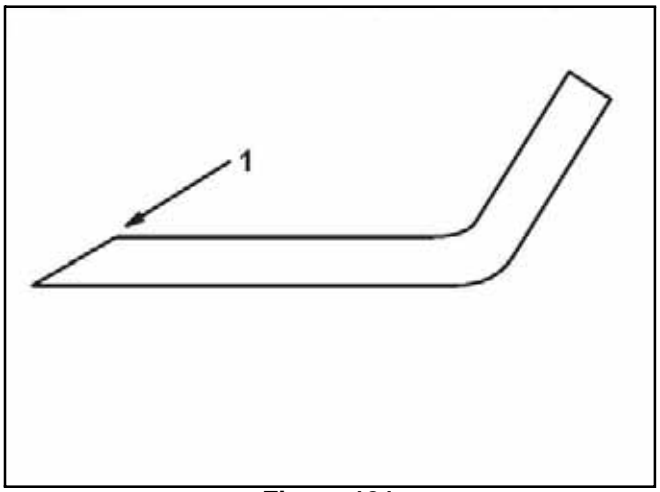


Figure 191 M-1854

(1) Sharpen at original angle

2. Check the balance of the blade by putting it on a blade balancer (Figure 192). If the blade stays in a horizontal position, the blade is balanced and can be used. If the blade is not balanced, file some metal off the end of the sail area only (Figure 190). Repeat this procedure until the blade is balanced.

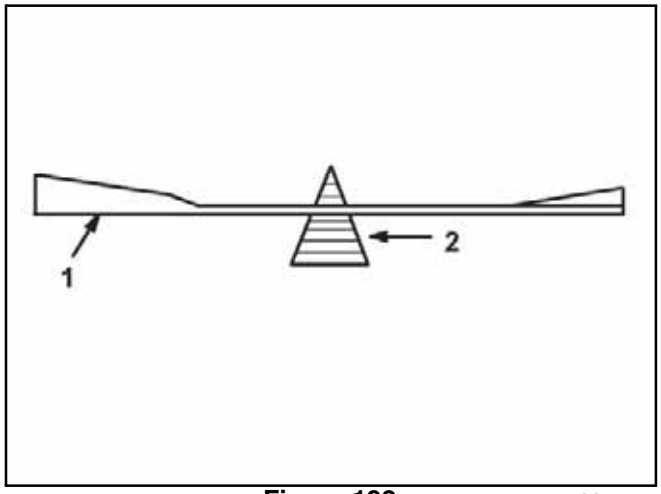


Figure 192 M-1855

(1) Blade	(2) Balancer

Installing the Blades

1. Install the blade onto the spindle shaft (Figure 190).

Important The sail part of the blade must be pointing upward, toward the inside of the mower to ensure proper cutting (Figure 190).

2. Install the washer, lock washer and blade bolt (Figure 190). Torque the blade bolt to 85 - 110 ft-lb (115 - 140 N-m).

Correcting Uneven Cutting (Fixed Deck)

If one deck blade cuts lower than the other, correct as follows.

Note: Tire air pressure is critical in these procedures. Make sure all tires have correct pressure.

1. Stop the engine, remove the key and disconnect the spark plug wire(s) from the spark plug(s).

2. Adjust the tire pressure in all tires to specifications.

3. Check that the blades and spindle shafts are not bent. Refer to "Checking for Bent Blades" on page 7 - 18.

4. Set the height-of-cut to the 4 in. (102mm) position. Refer to "Matching Height-of-Cut (Fixed Deck)" on page 7 - 4.

Replace Spindle Bearings (Fixed Deck)

1. Remove the spindle through bolt.

2. Use a bolt grip puller to remove the pulley.

Figure 193 0616-12

3. Remove the spindle shaft and shield (Figure 194).

Figure 194 0616-13

4. Remove the 6 nuts and bolts securing the spindle to the deck (Figure 195).

Figure 195 0616-17

5. Support the spindle flange. Move the bearing spacer to the side and use a drift to drive out the upper bearing. Remove the bearing spacer (Figure 196).

Figure 196 0616-15

6. Remove the snap ring securing the lower bearing (Figure 197).

Figure 197 0616-14

7. Drive the lower bearing from the housing.

8. Press in a new upper bearing until it seats at the bottom of its bore (Figure 198).

Figure 198 0616-16

9. Insert the bearing spacer and press the lower bearing in its bore until you can install the snap ring.

Replace Spindle Bearings (Floating Deck)

1. Remove the cutting deck. Refer to "Mower Deck Removal (Fixed Deck Models)" on page 7 - 28.

2. Loosen the spindle nut (Figure 199).

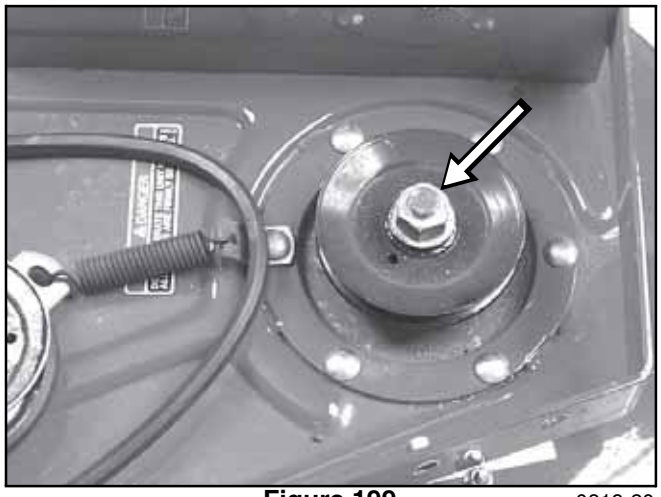


Figure 199 0819-20

   a. Block the blade with a piece of wood to prevent the spindle from turning.

   b. Loosen the spindle nut.

3. Remove the cutting blade (Figure 200).

Figure 200 0819-19

4. Remove the 6 nuts and carriage bolts securing the spindle housing to the deck (Figure 201).

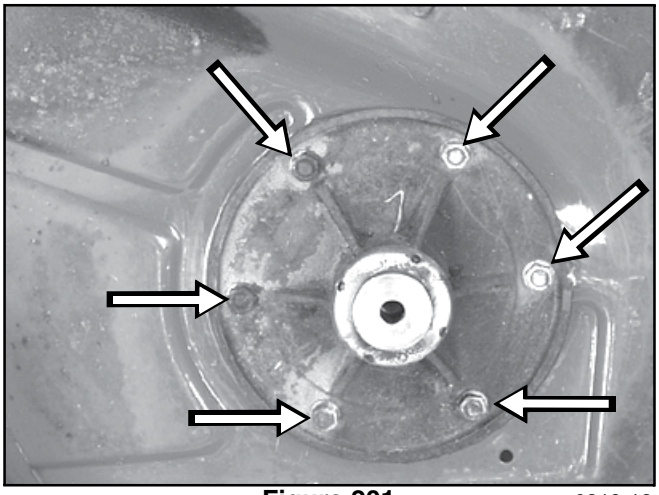


Figure 201 0819-18

5. Place the spindle in a vise and remove the nut, washer, pulley, and housing from the spindle (Figure 202).

Figure 202 0819-23

6. Remove the washer from the lower bearing and slide the bearing from the housing (Figure 203).

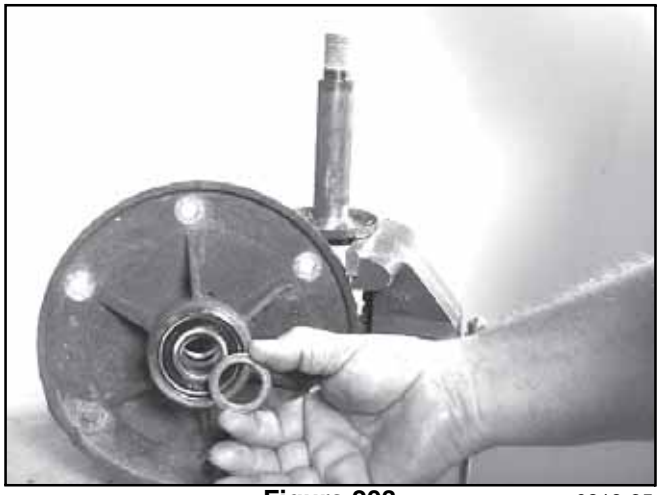
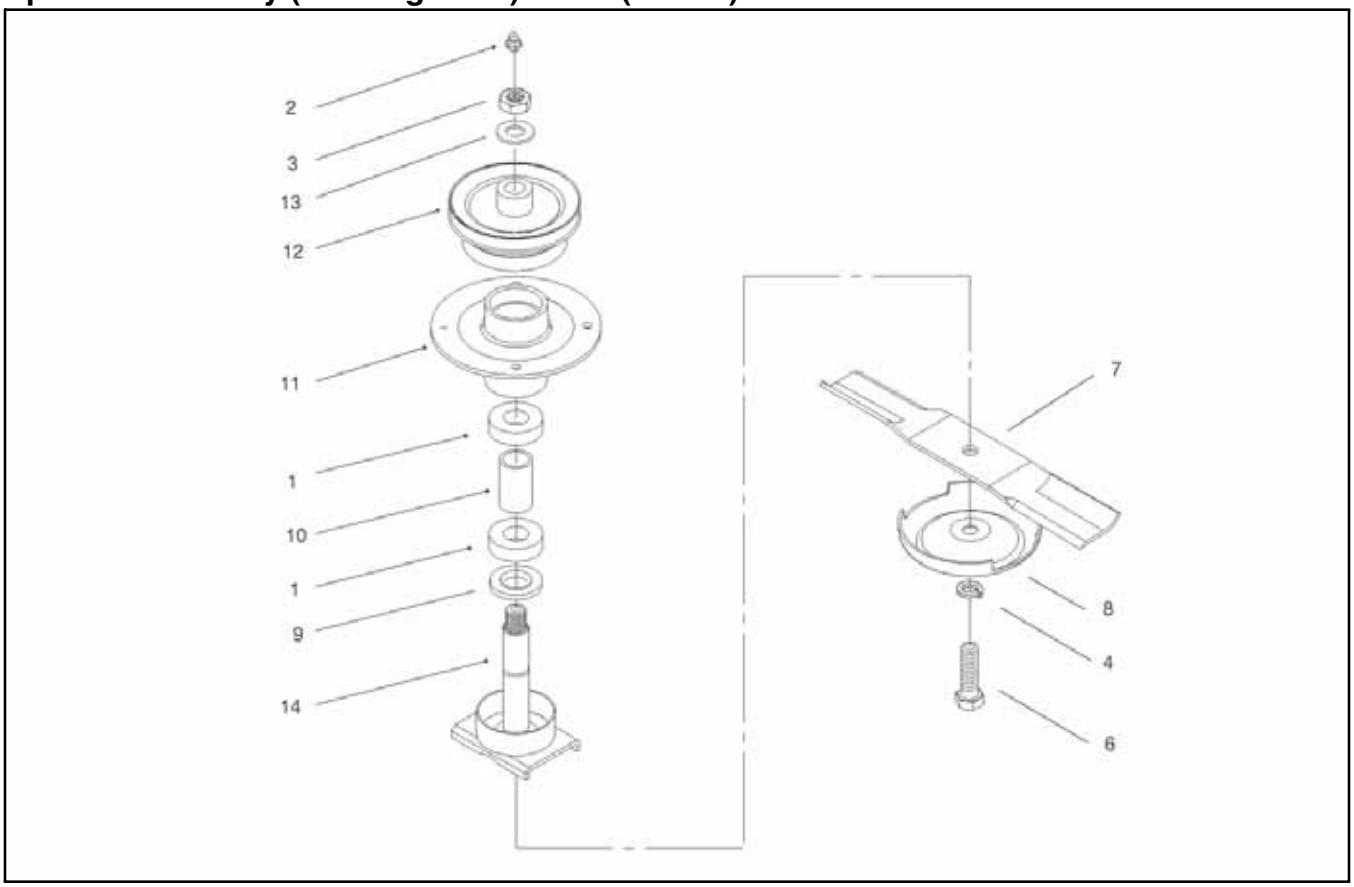


Figure 203 0819-25

7. Slide the upper bearing and bearing spacer from the housing.

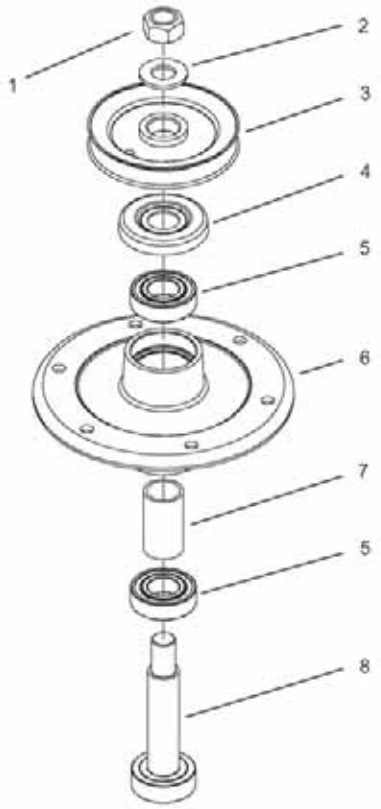
8. Reverse the above steps to reassemble.

Spindle Assembly (Floating Deck) 44 in. (112cm)



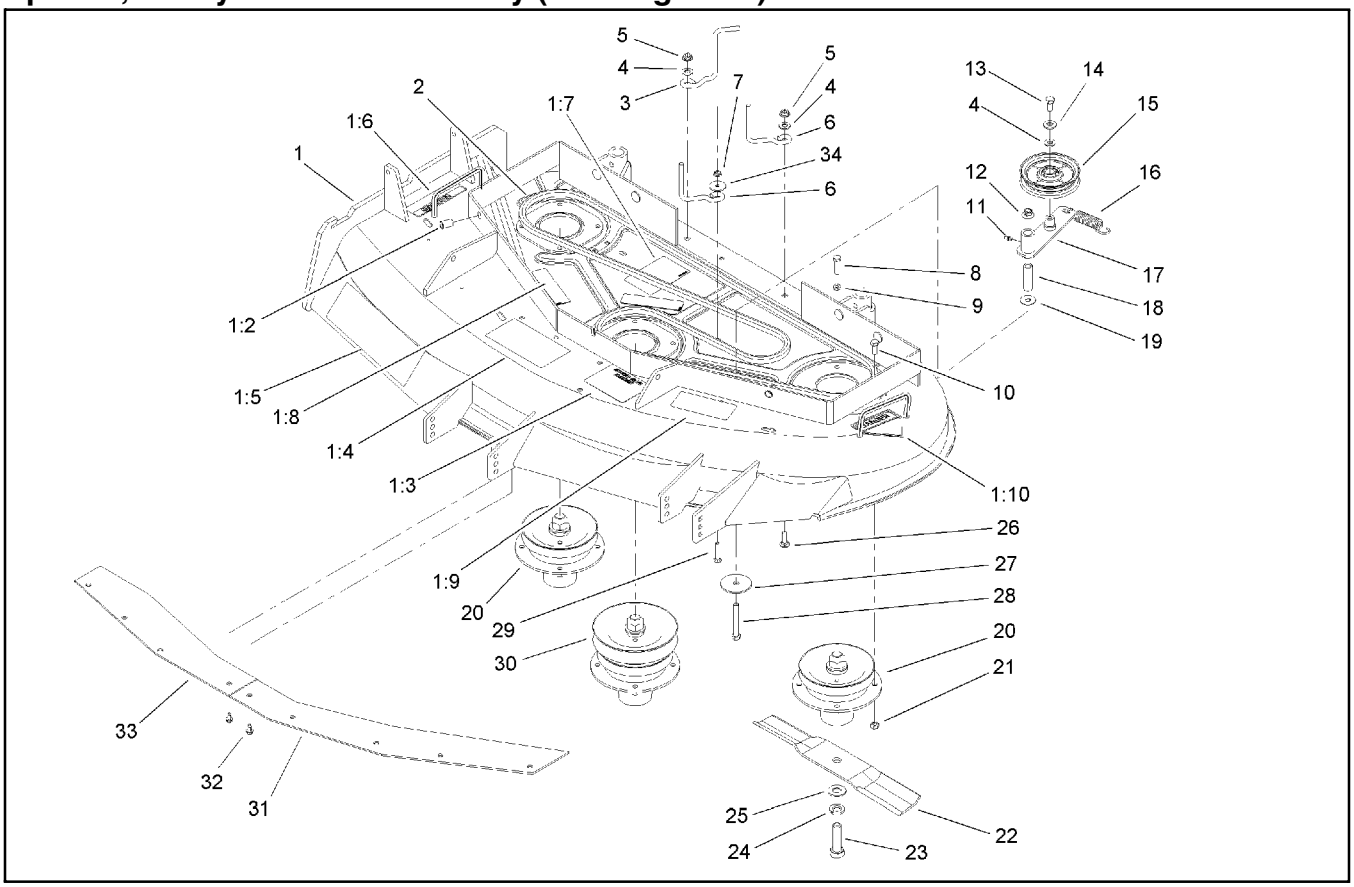
Ref. No.	Qty.	Description
1	2	Bearing
2	1	Fitting–Grease
3	1	Nut–Jam
4	1	Washer–Lock, Sp
6	1	Screw–Blade
7	1	Blade
8	1	Cup–Scalp, Anti
9	1	Spacer–Spindle
10	1	Spacer–Bearing
11	1	Spindle Housing
12	1	Pulley ASM–Center
13	1	Washer–Pinion
14	1	Shaft–Spindle

Spindle Assembly (Floating Deck) 36 in./91cm, 52 in./132cm



Ref. No.	Qty.	Description
1	2	Bearing
2	1	Fitting–Grease
3	1	Nut–Jam
4	1	Washer–Lock, Sp
6	1	Screw–Blade
7	1	Blade
8	1	Cup–Scalp, Anti
9	1	Spacer–Spindle
10	1	Spacer–Bearing
11	1	Spindle Housing
12	1	Pulley ASM–Center
13	1	Washer–Pinion
14	1	Shaft–Spindle

Spindle, Pulley and Belt Assembly (Floating Deck)



Ref	Qty.	Description
1	1	Deck ASM
1:2	2	Insert-Threaded
1:3	1	Decal-Scalp, Anti
1:4	1	Decal-Danger
1:5	1	Decal
1:6	1	Decal-Warning
1:7	1	Decal-Routing, Belt
1:8	3	Decal-Danger
1:9	1	Decal-Torque
1:10	1	Decal-Danger
2	1	V-Belt
3	1	Guide-Belt
4	3	Washer-Flat
5	2	Nut-HF
6	2	Rod-Belt
7	1	Nut-Lock, HHF
8	1	Screw-HH
9	1	Nut-Jam
10	11	Screw-HH
11	1	Fitting-Grease
12	1	Nut-HF
13	1	Screw-HH
14	1	Washer-Belleville
15	1	Pulley-Idler

Ref	Qty.	Description
16	1	Spring-Extension
17	1	Idler Arm ASM
18	1	Tube-Idler
19	1	Washer
20	2	Spindle Housing ASM
21	12	Nut-Lock, NI
22	3	Blade
23	3	Screw-Blade
24	3	Washer-Lock
25	3	Washer-Flat
26	2	Bolt-CARR
27	1	Washer-End
28	1	Screw-HH
29	1	Screw-CARR
30	1	Spindle Housing ASM
31	1	Plate-Blowout, LH
32	9	Screw
33	1	Plate-Blowout, RH
34	1	Washer-Retainer, Pulley

Replacing the Castor Wheel Fork Bushings (All Models)

The castor wheel forks are mounted in bushings pressed into the top and bottom of the carrier frame mounting tubes. To check the bushings, move the castor forks back and forth and side-to-side. If a castor fork is loose, the bushings are worn and must be replaced.

1. Raise the cutting unit so the castor wheels are off the floor, then block up the front of the mower with jack stands.

2. Remove the locking pin and spacer(s) from the top of the castor wheel fork (Figure 204).

3. Pull the castor wheel fork out of the mounting tube, leaving the spacer(s) on the bottom of the fork. Remember the location of the spacers on each fork to ensure correct installation, and to maintain a level deck.

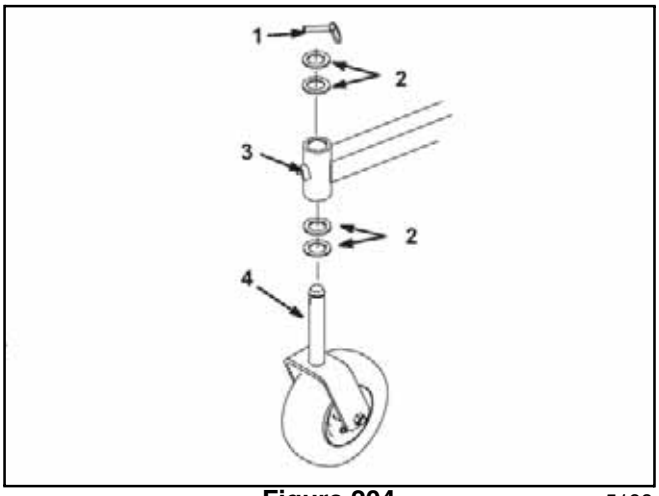


Figure 204 m-5198

(1) Locking pin	(3) Carrier frame mounting tube
(2) Spacers (locate as required)	(4) Castor wheel fork

4. Insert a pin punch into the mounting tube and carefully drive out the bushings (Figure 205). Clean the inside of the mounting tube.

5. Grease the inside and outside of the new bushings. Use a hammer and flat plate to carefully drive the bushings into the mounting tube.

6. Inspect the castor wheel fork for wear and replace if necessary (Figure 204).

7. Slide the castor wheel fork through the bushings in the mounting tube. Replace the spacer(s) onto the fork and secure with the retaining ring (Figure 204).

Important The inside diameter of the bushings may collapse slightly when installed. If the castor wheel fork does not slide into the new bushings, ream both bushings to an inside diameter of 1.126 in. (28.6mm).

8. Grease the fitting on the carrier frame mounting tube using No. 2 general purpose lithium base or molybdenum base grease.

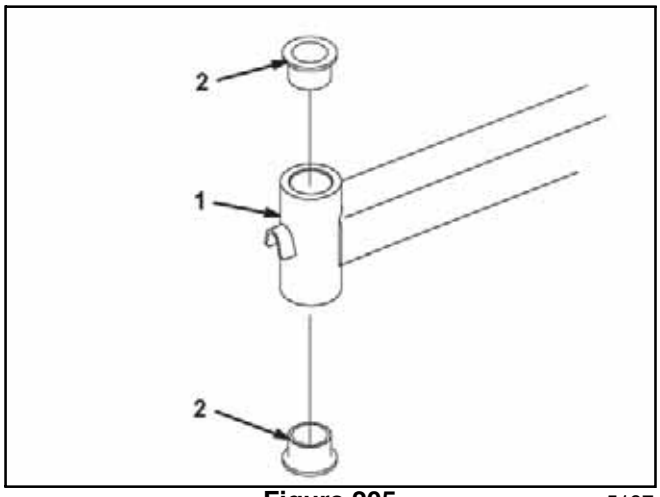


Figure 205 m-5197

(1) Carrier frame mounting tube	(2) Bushing

Castor Wheel and Bearings Service (Floating Deck)

The castor wheels rotate on a roller bearing supported by a spanner bushing. If the bearing is kept well lubricated, wear will be minimal. Failure to keep the bearing well lubricated will cause rapid wear. A wobbly castor wheel usually indicates a worn bearing.

1. Remove the locknut and wheel bolt holding the castor wheel to the castor fork (Figure 206).

2. Remove one bushing, then pull the spanner bushing and roller bearing out of the wheel hub (Figure 206).

3. Remove the other bushing from the wheel hub and clean any grease and dirt from the wheel hub (Figure 206).

4. Inspect the roller bearing, bushings, spanner bushing and inside of the wheel hub for wear. Replace any defective or worn parts (Figure 206).

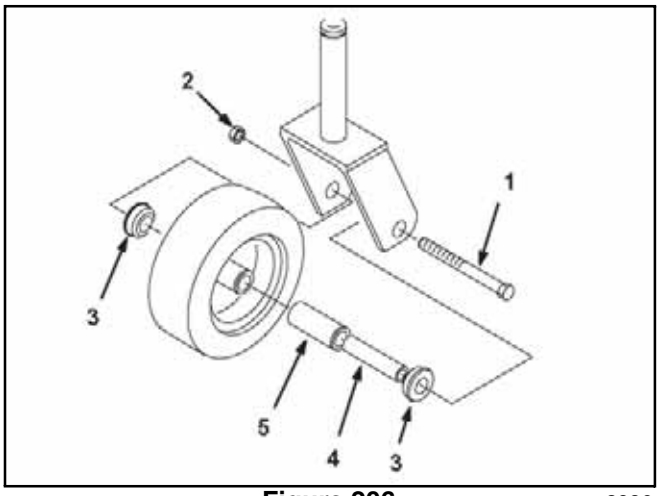


Figure 206 m-3986

(1) Locknut	(4) Spanner bushing
(2) Wheel bolt	(5) Roller bearing
(3) Bushing	

5. To assemble, place one (1) bushing into the wheel hub. Grease the roller bearing and spanner bushing and slide them into the wheel hub. Place the second bushing into the wheel hub (Figure 206).

6. Install the castor wheel into the castor fork and secure with the wheel bolt and locknut. Tighten the locknut until the spanner bushing bottoms against the inside of the castor forks (Figure 206).

7. Grease the fitting on the castor wheel.

Replacing the Grass Deflector (All Models)

WARNING

An uncovered discharge opening could allow the lawn mower to throw objects in the operator's or bystander's direction and result in serious injury. Also, contact with the blade could occur.

Never operate the lawn mower unless you install a cover plate, a mulch plate, or a grass chute and catcher.

Remove the locknut, bolt, spring and spacer holding the deflector to the pivot brackets (Fig. 67). Remove grass deflector.

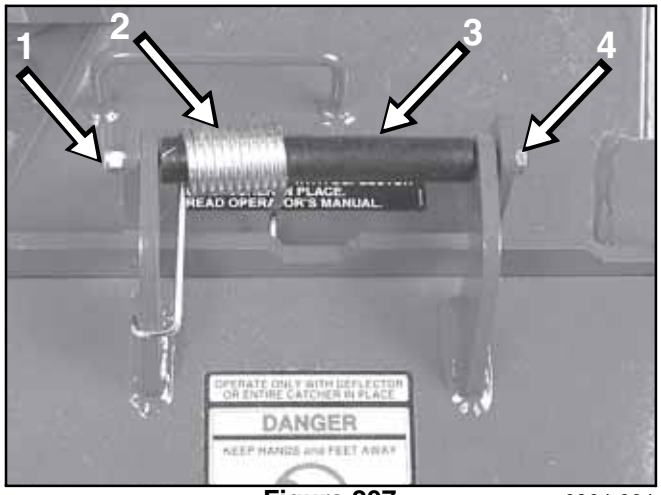


Figure 207 0904-004

(1) Locknut	(3) Spacer
(2) Spring	(4) Wheel bolt

Mower Deck Removal (Fixed Deck Models)

1. Apply the parking brake.

2. Remove the deck cover.

3. With the PTO disengaged, remove the drive belt from the idler pulley (Figure 208). Then remove the belt from the engine pulley.

Figure 208 0616-02

4. Disconnect the PTO linkage from the assist arm (Figure 209).

Figure 209 0616-04

5. Block the rear of the frame to prevent the machine from tipping backwards when the deck is removed.

CAUTION

The mower deck is heavy. Keep hands and feet clear when disconnecting the deck from the mower frame.

6. Block the trailing edge of the deck. Then, remove the 6 bolts securing the mower deck to the frame (Figure 210).

Figure 210 0616-06

Mower Deck Removal (Floating Deck)

1. Remove the deck covers (Figure 211).

Figure 211 0819-22

2. Remove the PTO drive belt.

3. Using a large channel lock pliers, move the idler pulley arm against spring tension and slip the PTO drive belt off of the idler pulley (Figure 212).

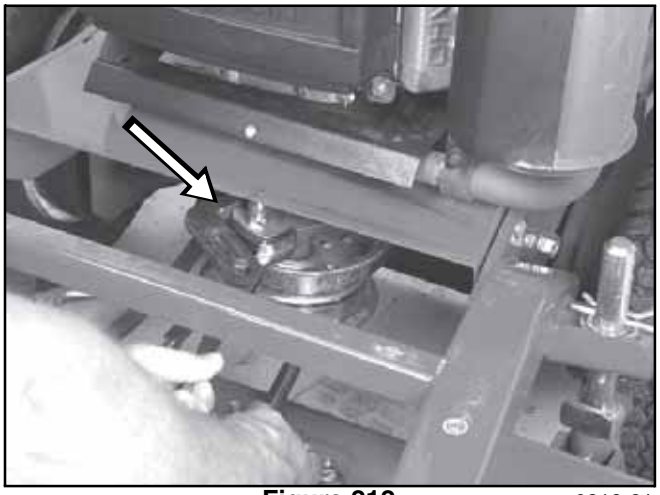


Figure 212 0819-21

4. Remove the PTO drive belt from the clutch pulley.

5. Remove the deck from the carrier frame.

6. Support the rear of the frame with a safety stand to prevent the unit from tipping backwards when the deck is removed.

7. Remove the hairpin cotters and washers from the height adjustment pins.

8. Remove the safety stand and rock the machine back on the drive wheels until the carrier frame clears the drive wheels. Then, roll the deck out from under the carrier frame.

9. Reposition the safety stand under the rear of the frame.

Installation

Follow the removal procedures in reverse.

THIS PAGE INTENTIONALLY LEFT BLANK

Contents - Wiring Diagrams

T-Bar (Floating Deck - Hydro) . . . . . 8 - 16
T-Bar (Fixed Deck - Gear) . . . . . 8 - 17
T-Bar (Fixed Deck - Gear) . . . . . 8 - 18
T-Bar (Fixed Deck - Gear) . . . . . 8 - 19
T-Bar (Fixed Deck - Gear) . . . . . 8 - 20
T-Bar (Floating Deck - Gear) . . . . . 8 - 21
T-Bar (Floating Deck - Gear) . . . . . 8 - 22
T-Bar (Floating Deck - Gear) . . . . . 8 - 23
T-Bar (Floating Deck - Gear) . . . . . 8 - 24
T-Bar (Floating Deck - Gear and 1988 / 1999 Hydro) . . . . . 8 - 25
T-Bar (Floating Deck Gear and: 30290, 30291 & 30292 Hydro) . . . . . 8 - 26
T-Bar (Floating Deck - Hydro) Model #'s 30290, 30291, 30291TE, 30292 . . . . . 8 - 27
T Bar (Floating Deck - Hydro) . . . . . 8 - 28
T-Bar (Floating Deck - Hydro) . . . . . 8 - 29
T-Bar (Floating Deck - Hydro) . . . . . 8 - 30
Pistol Grip (Fixed Deck - Gear) . . . . . 8 - 31
Pistol Grip (Fixed Deck - Gear) . . . . . 8 - 32
Pistol Grip (Fixed Deck - Gear) . . . . . 8 - 33
Pistol Grip (Fixed Deck - Hydro) . . . . . 8 - 34
Pistol Grip (Fixed Deck - Hydro) . . . . . 8 - 35
Pistol Grip (Floating Deck - Gear) . . . . . 8 - 36
Pistol Grip (Floating Deck - Gear) . . . . . 8 - 37
Pistol Grip (Floating Deck - Hydro) . . . . . 8 - 38
Pistol Grip (Floating Deck - Hydro) . . . . . 8 - 39
Pistol Grip (Floating Deck - Hydro) . . . . . 8 - 40
Pistol Grip (Floating Deck - Hydro) . . . . . 8 - 41
Pistol Grip (Floating Deck - Hydro) . . . . . 8 - 42
Pistol Grip (Floating Deck - Hydro) . . . . . 8 - 43
Pistol Grip (Floating Deck - Hydro) . . . . . 8 - 44
Pistol Grip (Floating Deck - Hydro) . . . . . 8 - 45

ELECTRICAL

Electrical Systems

This manual covers a variety of machines. From recoil start models with simple electrical systems to electric start models with an electric blade clutch. Some of the electrical components are used in different ways in different models. It is important you use the wiring diagram for your specific model.

We will start by identifying the individual parts, locating them and providing testing procedures. At the back of this section is a wiring diagram for each model covered in this manual.

Tools

Volt Ohm meter.
Flat and Phillips screwdrivers.
Box and open end wrenches of various sizes.

Additional information can be found in the LCE Electrical Troubleshooting CD #492-4757, available through your Toro parts supplier.

Caution

Before performing any tests with a continuity light or ohmmeter, disconnect the component from the wire harness. This ensures you are testing the component, not some other circuit.

Interlock modules and delay modules MUST be removed from the circuit before performing any tests with an ohmmeter or continuity light. Battery voltage can damage these modules if applied to the wrong terminals.

Servicing the Fuse (T-Bar and Pistol Grip Models)

Purpose

Fuses are used in several of the circuits to limit damage in the event of excessive current flow. If a fuse fails look for a short circuit or any component that appears to have been overheated. A failed fuse is usually a sign of a problem in that circuit.

Location

Fuses are located in a variety of places on the various models. The first places to look should be under the control panel or on the chassis alongside the engine. Most will be found in one of those two places. One location is shown here, under the control panel (Figure 213).

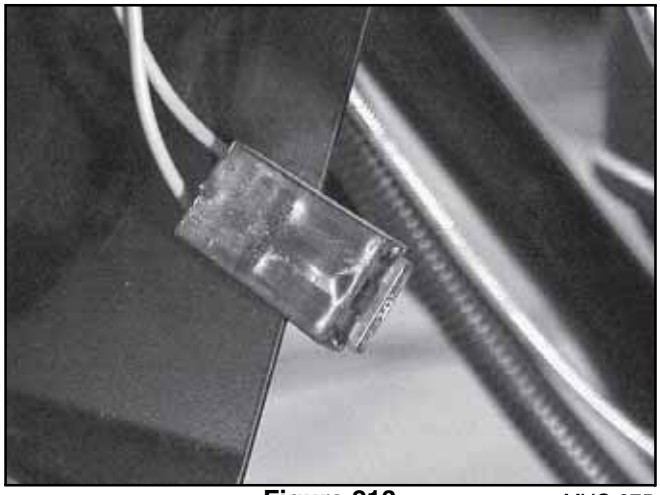


Figure 213 MVC-075

Testing

A failed fuse will often be discolored or melted. However, not all failures are easy to see. A fuse can be checked with a continuity tester if there is doubt. If there is no continuity between the terminals, replace the fuse, even if it appears good (Figure 213).

Fuse: blade-type. There are 7, 5, 10, 20, 25 and 30 amp fuses used in these models. Refer to the wiring diagram for your model to determine the proper size.

Relay

Purpose

A relay is an electrically operated switch. An electrical current is sent to the relay which can be used to control more than one circuit. It can turn a circuit on or off or turn one circuit on and another off at the same time. It all depends on which terminals are used.

We have at least 3 different part numbers of relays. However, they all work the same and are tested in the same manner. The difference is in the method used to mount them and the amount of amperage they can handle.

Note that there is a diagram on the side of the relay and each terminal is numbered (Figure 215).

Location

The relays are located under the control panel on the mid size mowers.

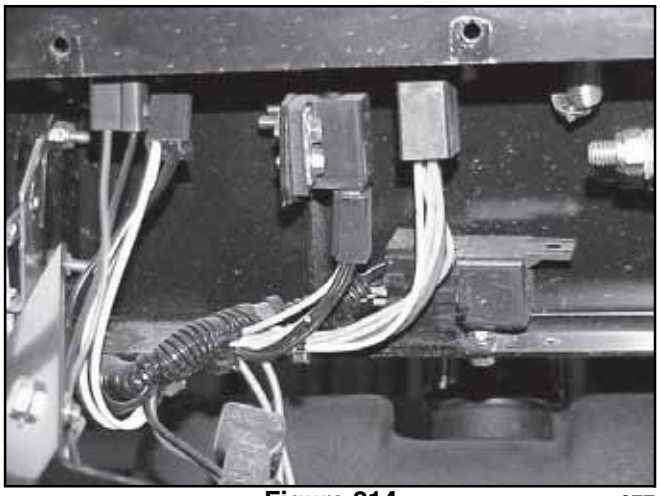


Figure 214 mvc-077

How It Works

A relay is an electrically actuated switch.

1. Coil: Terminals 85 and 86 are connected to a coil. Applying 12 volts to these terminals energizes the coil turning it into an electromagnet.
2. Switch: Terminals 30, 87, and 87a are actually part of a single pole, double throw (SPDT) switch. Terminal 30 is the common lead. The switch is spring loaded so that 30 and 87a are connected when the coil is not energized. When the coil is energized, the switch is "thrown" and 30 and 87 are connected (Figure 215).

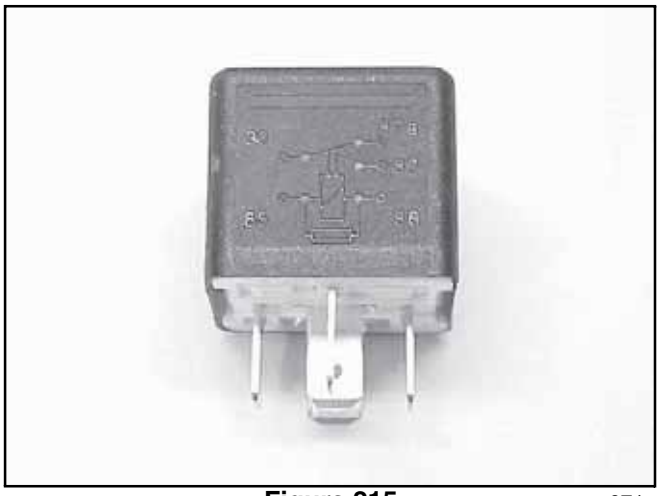


Figure 215 mvc-671x

Testing

1. Disconnect the relay from the harness.
2. Verify the coil resistance between terminals 85 and 86 with a multimeter (ohms setting). Resistance should be from 70 to 90 ohms. There should be continuity between terminals 87a and 30.
3. Connect multimeter (ohms setting) leads to relay terminals 30 and 87. Ground terminal 86 and apply +12 VDC to terminal 85. The relay should make and break continuity between terminals 30 and 87 as 12 VDC is applied and removed from terminal 85.
4. Connect a multimeter (ohms setting) leads to relay terminals 30 and 87a. Apply +12 VDC to terminal 85. With terminal 86 still grounded, the relay should break and make continuity between terminals 30 and 87a as 12 VDC is applied and removed from the terminal.

5. Disconnect voltage and multimeter leads from relay terminals (Figure 216).

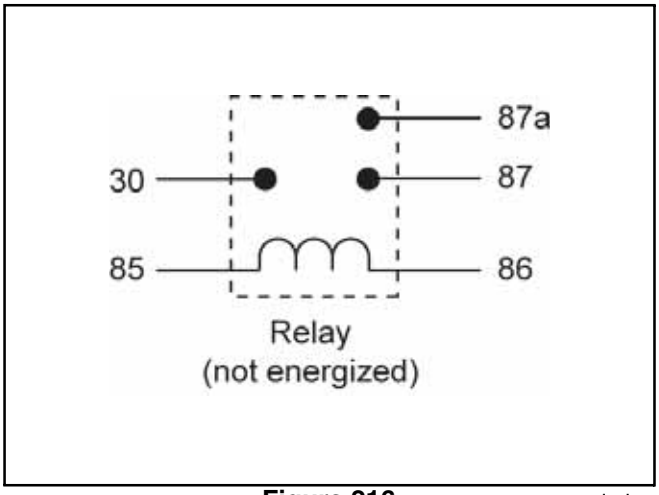


Figure 216 xlrelay

Solenoid

Purpose

The solenoid's purpose is simply to connect the battery to the starter motor when the ignition switch is turned to "START". With a solenoid we can use lighter wire and a lighter switch to control the power to the starter. Long lengths of battery cable are expensive and inefficient.

Location

The solenoid is located on the chassis next to the engine.

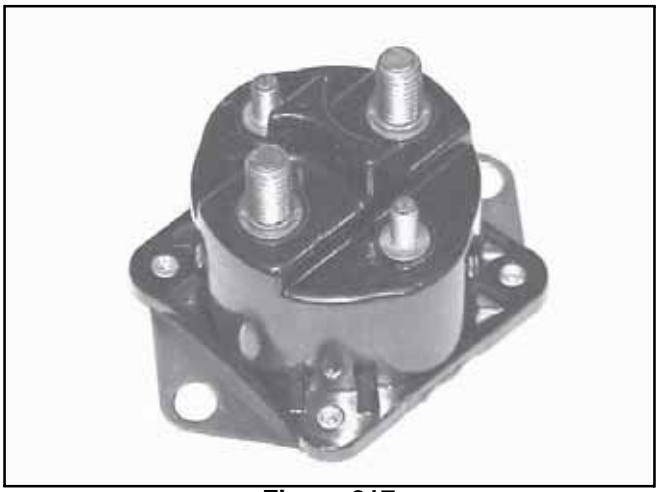


Figure 217 mvc-061

How It Works

The solenoid has two primary parts. One is a coil of wire wrapped around an iron core. The other part is a bar type switch. Because it has large contact area with the contact terminals it can easily handle the high current loads required by the starter motor.

When 12 volts is applied to the coil, it becomes an electromagnet. This quickly pulls the bar toward the contact terminals and closes the switch. When power is removed from the coil, the spring loaded bar returns to its "normally open" position.

The solenoid closes and opens the switch very quickly. This minimizes the "arcing" that can damage other types of switches. The ignition switch is protected because only a small amount of current is needed to activate the coil.

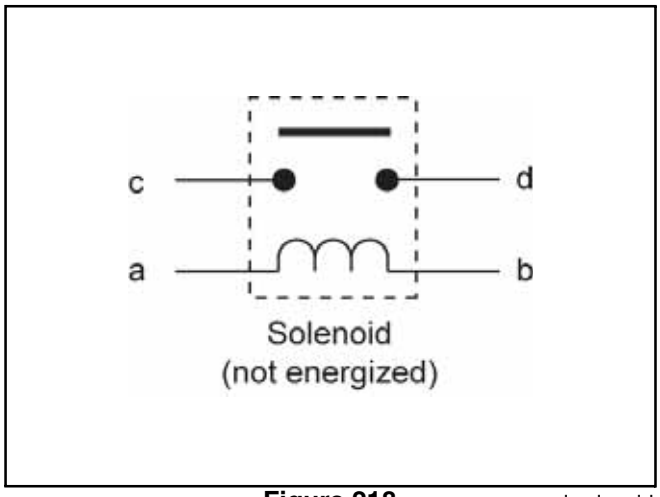


Figure 218 xl solenoid

Testing

1. Disconnect the solenoid from the wiring harness.

2. With a multimeter (ohms setting), check to ensure that there is no continuity between the two large terminals.

3. Apply +12VDC to the two smaller terminals. You should hear a click and get continuity between the two big terminals. If you disconnect the battery, the solenoid should again “click” and loose continuity between the big terminals.

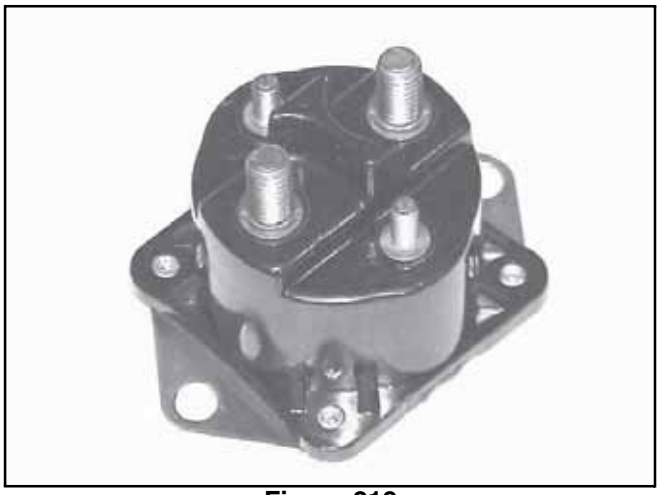


Figure 219 mvc-061x

Ignition Switch

Purpose

There are two types of ignition switches used. The recoil start models use a simple off/on type of switch. The electric start models use a three position switch with multiple circuits.

Location

The ignition switch is located on the control panel within easy reach of the operator.

Figure 220 146-0001

How It Works

On recoil start models the ignition is a simple on/off switch. One wire connects to chassis ground and the other to the magneto. When the key is turned off the switch closes and grounds the magneto. Turn the key on and the ground is disconnected.

Electric start models require a switch with three positions; OFF, RUN, and START. The START position is spring loaded so the cylinder automatically returns to RUN once the key is released.

We use three different switches on electric start models. Two have five terminals and the other has six. Terminals of the ignition switch are viewed from the back side (terminal end) of switch (Figure 221, Figure 222, Figure 223).

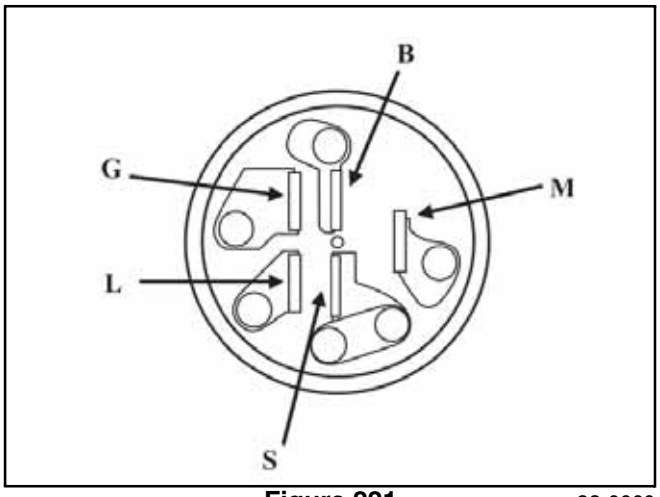


Figure 221 23-0660

OFF	G + M
ON	B + L
START	B + S

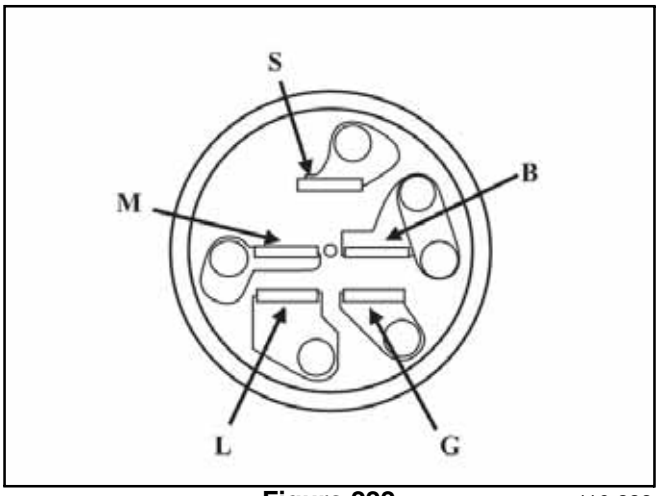


Figure 222 116-338

OFF	G + M
ON	B + L
START	B + L + S

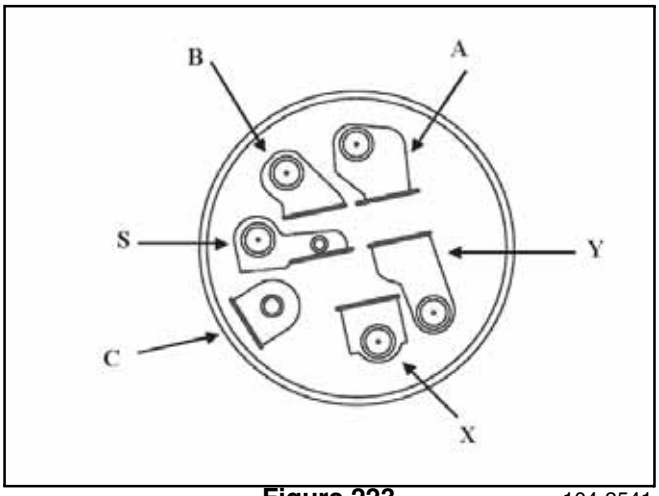


Figure 223 104-2541

OFF	None	
ON	B + I + A	X + Y
START	B + I + S	

Testing

1. Disconnect the switch from the wiring harness.

2. Verify that continuity exists between the terminals listed for the switch position. Verify that there is **NO** continuity between terminals not listed for switch position. Note: the chart for the terminal connections is also in the wiring diagram for each model.

Electric PTO Clutch

Purpose

This clutch electrically controls the engagement and disengagement of the Power Take Off (PTO) pulley.

Location

The electric clutch is located on the PTO end of the engine crankshaft (Figure 224).

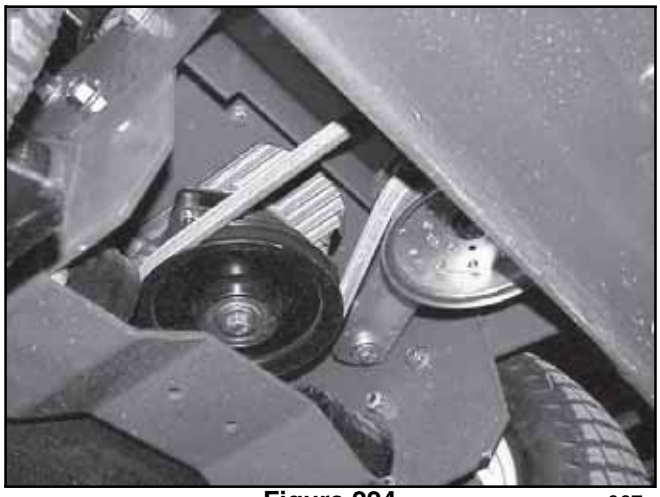


Figure 224 mvc-067x

How It Works

The PTO clutch is composed of three major components; the field, the clutch plate, and the friction plate. The clutch plate always turns with the engine. The field is a coil of wire on an iron core, which becomes an electromagnet when power is applied.

The friction plate is the only piece that can slide up and down on the crankshaft axis. It is normally spring loaded so that it is not in contact with the clutch plate and is pressed against the brake material opposite the clutch. When power is applied, the friction plate is drawn toward the clutch plate and two rotate as one.

Testing

If the electric PTO clutch is not engaging or is suspected as a cause of electrical problems, use the following troubleshooting steps. The procedures will help you determine if the clutch has failed or is the cause of the electrical problem.

Coil Resistance Measurement

1. Disengage the PTO, set the parking, turn the ignition key to ***OFF*** and remove the key.

2. Disconnect clutch wire connector.

3. Set the multimeter or volt/ohm meter to check resistance (ohms).

4. Connect the meter lead wires to the wires in the clutch connector (Figure 225).

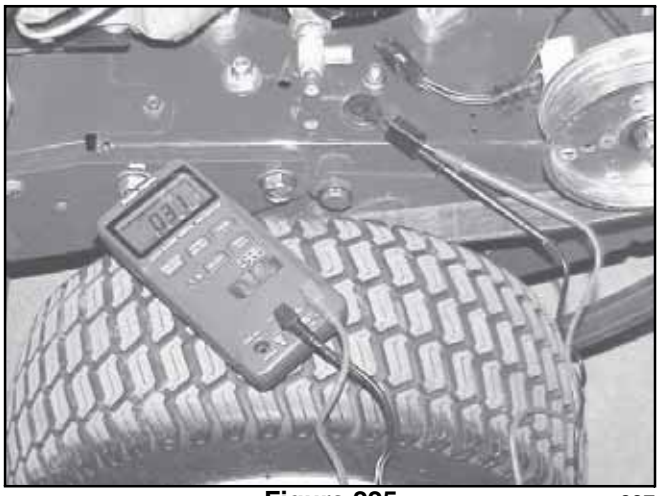


Figure 225 mvc-887

5. The meter should read between 2.8 ohms and 3.2 ohms. If the reading is above or below these readings, the field has failed and needs to be replaced. If the reading is between these two limits, proceed.

6. Measure the resistance between either of the wires on the clutch connector to a ground on the chassis. There should be no continuity. If there is, the insulation in the coil has failed and the clutch must be replaced (Figure 226).

Figure 226 mvc-891x

7. A final test is to connect a known good 12v battery to the clutch. It should engage when the voltage is applied and disengage when voltage is removed. If the clutch passes the resistance test but does not engage when a battery is applied there is some type of mechanical failure.

Testing the Clutch Power Supply

Test the clutch as outlined above. If the clutch engages using a jumper battery, you must look to the power source.

Recoil Start Models

Begin by testing the alternator using the engine manufacturers specifications. If your model uses a bridge rectifier, obtain the DC voltage at the rectifier terminals marked (+ and -); make a note of the reading.

Disconnect the clutch from the wiring harness. Set a voltmeter on DC volts and connect the probes to the terminals at the end of the harness (Figure 227).

Figure 227 mvc-894x

Start the engine and run at full speed. The voltage reading should match the open circuit voltage specifications for the alternator on that engine. If the voltage is the same the wire harness and switches are good. A voltage drop indicates a poor connection or a failed switch between the alternator and clutch terminal.

Electric Start Models

Perform the tests on the clutch as shown previously. On electric start models the clutch is powered by both the battery and alternator.

If there are no starting complaints, the battery is likely good. If there have been starting complaints, use a known good battery.

With the engine off, turn the key to run and engage the clutch switch. There should be battery voltage to the clutch and the clutch should engage. If it does, the wiring, switch and clutch are all good. If not test the individual components using the procedures provided.

Turn the clutch off. Connect a DC voltmeter to the battery terminals and note the voltage. Start the engine and run at full speed. If the voltage rises, the alternator is good. If the voltage does not rise, test the alternator per the engine manufacturers specifications and the wiring between the alternator and battery.

Clutch Burnishing Procedure

The clutch should be burnished as part of the pre-delivery service, or whenever a new clutch is installed. Burnishing polishes the clutch plate, allowing for smooth clutch engagement.

With deck drive belt installed, run the engine at half throttle. Engage and disengage the mower 5 times (10 seconds on/10 off).

Increase engine RPM to 3/4 to full throttle. Engage and disengage mower 5 times (10 seconds on/ 10 seconds off).

Check the clutch air gap and adjust as needed. Refer to "Adjusting the Electric Clutch" on page 8 - 8.

Adjusting the Electric Clutch

The clutch is adjustable to ensure proper engagement and proper braking. Check adjustment after every 100 hours of operation.

1. To adjust the clutch, tighten or loosen the lock nuts on the flange studs (Figure 228).

2. Check adjustment by inserting a feeler gauge through the slots next to the studs (Figure 228).

3. The proper disengaged clearance between the clutch plates is 0.012 - 0.024 inch (0.30 - 0.60mm). It will be necessary to check this clearance at each of the three slots to ensure the plates are parallel to each other.

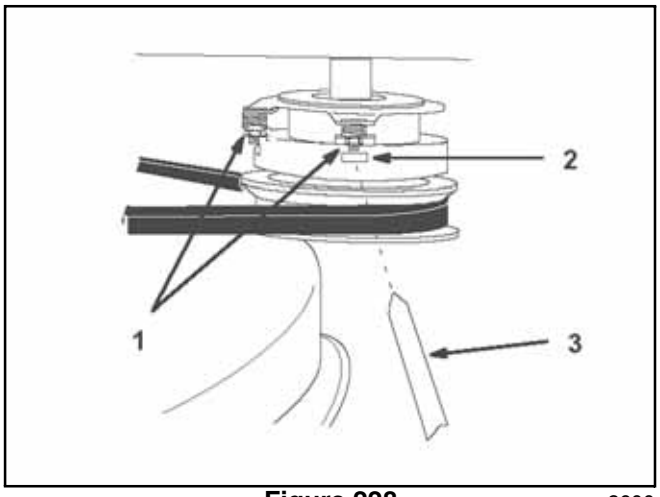


Figure 228 m-2600

(1) Adjusting nut (2) Slot	(3) Feeler gauge

PTO Switch

The PTO switch is typically used to turn the Electric PTO Clutch on and to function as part of the safety interlock system.

Location

The PTO switch is located on the control panel. (Figure 229).

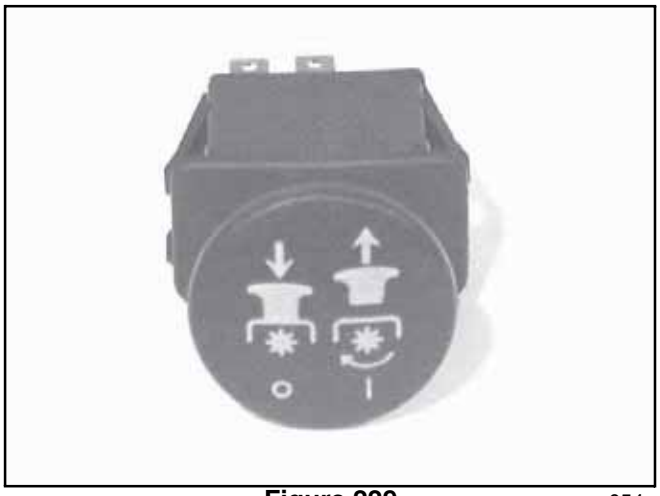


Figure 229 mvc-054x

How It Works

When the PTO switch is pulled out to the "ON" position, contacts inside the switch electrically connect various terminals. One terminal is connected to the wire that goes directly to the electric clutch. When the PTO is pulled out to the "ON" position, voltage flows to the electric clutch and engages.

Testing

1. Disengage the PTO, set the parking brake, and turn the ignition to ***OFF*** and remove the key.

2. Disconnect the wiring harness from the PTO switch.

3. Press in on the locking tabs, on each side of the switch, and pull the switch out of the control panel.

4. Verify that there is continuity between the appropriate terminals in the "ON" and "OFF" positions (Figure 230).

5. Replace the switch if your test results do not correspond with those given in Figure 230.

6. Mount the PTO switch back into the control panel and reinstall the wiring harness.

PTO Switch Test

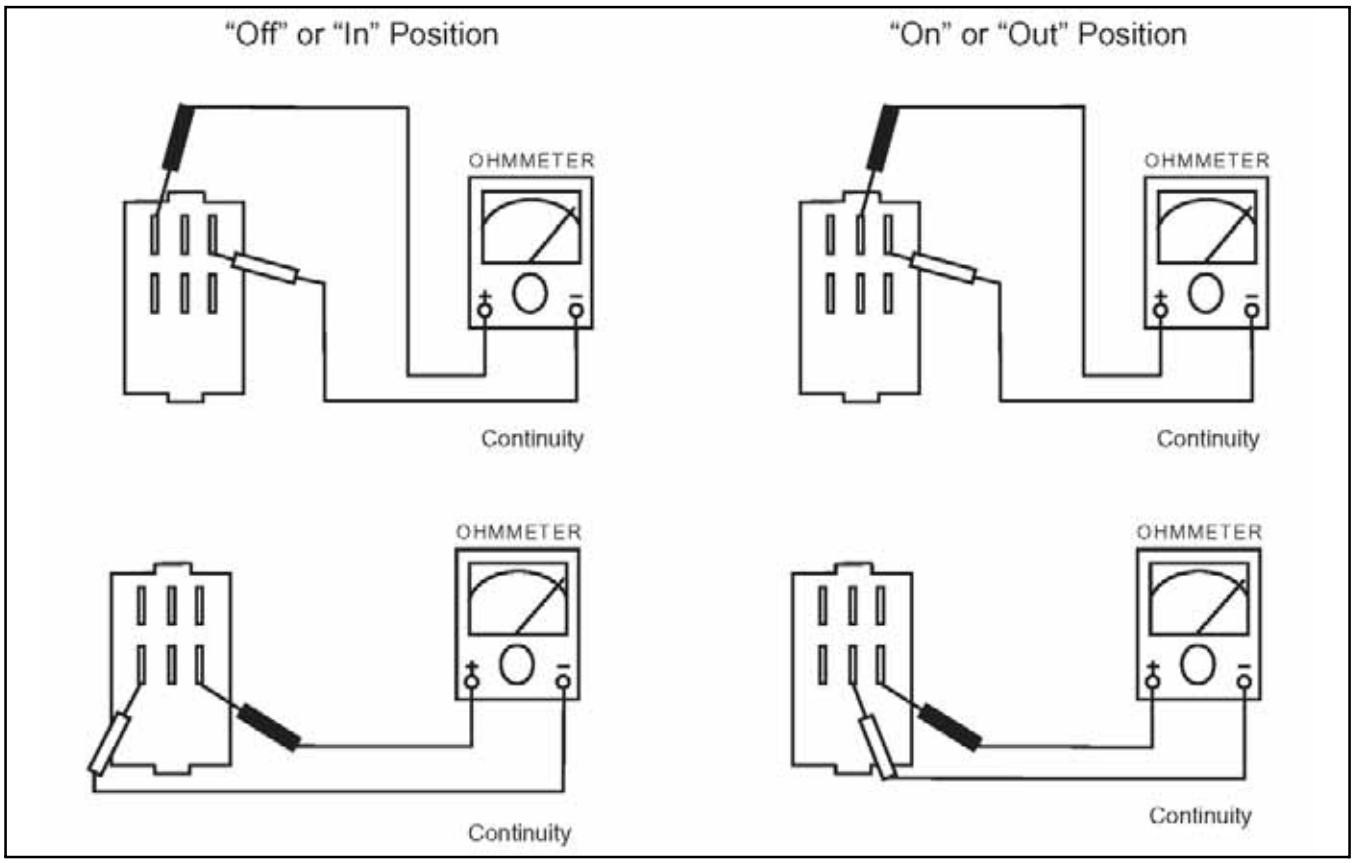


Figure 230

Transmission Switch (Gear Drive)

Purpose

This switch is used to determine if the transmission is in neutral.

Figure 231 mvc-056

Location

The transmission switch is screwed into the top of the transmission.

How It works

The transmission has a movable plate inside that the ball in this switch rides on. When in neutral a hole in this plate is positioned right below the switch. When the switch ball falls in this hole the switch closes.

Testing

1. Disconnect the switch from the wiring harness.
2. With a multimeter, check the continuity between the two terminals of the switch. There should be NO continuity when the transmission is in gear. (Ball in the switch depressed.)
3. Shift the transmission into neutral. The switch should have continuity. (Ball in the switch relaxed.)

Hourmeter

Purpose

The hourmeter is present to give an indication of operating hours. It is standard on some models an optional on others.

On some models it is connected between the clutch switch and clutch. In that instance it will measure clutch operating time not engine hours.

In other models it is connected between the alternator and clutch switch. In this situation it will receive power whenever the engine is running.

Location

The hourmeter is located in the control panel (Figure 232).

Figure 232 mvc-063

How It Works

Since a normal clock might be affected by variations in voltage and current, the hourmeter is made up of a combination of an electric "winder" and a mechanical clock movement. When power is applied, a coil is energized to wind the movement. The movement unwinds in about 2 seconds. As it finishes its rotation, it re-energizes the coil so that the cycle can start over.

Testing

Verify that 12 volts is present across the two terminals when the engine is running. If so, and the meter is not running, replace the meter. If 12 volts is not present, check the connections back towards the alternator or battery.

Switch (65-7410 & 1-513051)

Purpose

This switch is used in both the parking brake and transmission linkage. The switch is activated as the linkage to these components is engaged or disengaged.

Location

The location depends on the application. A parking brake switch application will be located in or near the brake linkage. The same applies with a transmission neutral application.

Common locations are on or under the traction frame and under the control panel. Activate the linkage in question and follow it, looking for the switch shown in Figure 233.

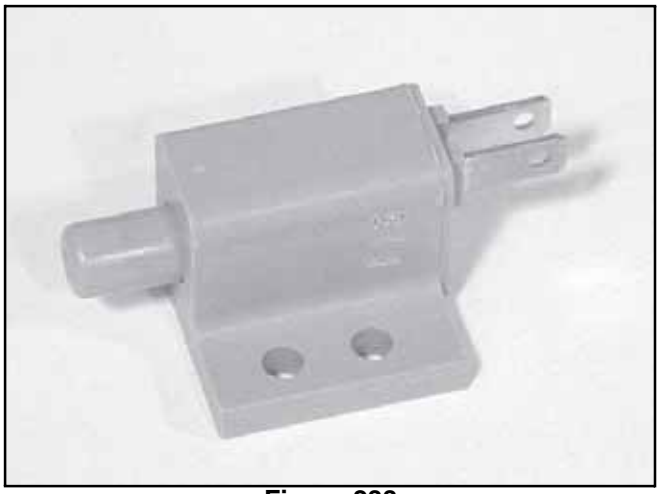


Figure 233 mvc-053

Testing

This is a normally open switch; when it is out in your hand there should be no continuity between the terminals. Use a ohmmeter to determine if the contacts open and close correctly.

Switch (95-1653)

Purpose

Like the previously shown switch, this part is used to determine if the parking brake is set and if the transmission is in neutral.

Location

The location depends on the application. A parking brake switch application will be located in or near the brake linkage.

The same applies to the transmission application. Common locations are under the control panel around the upper handle or on the traction frame near the transmission.

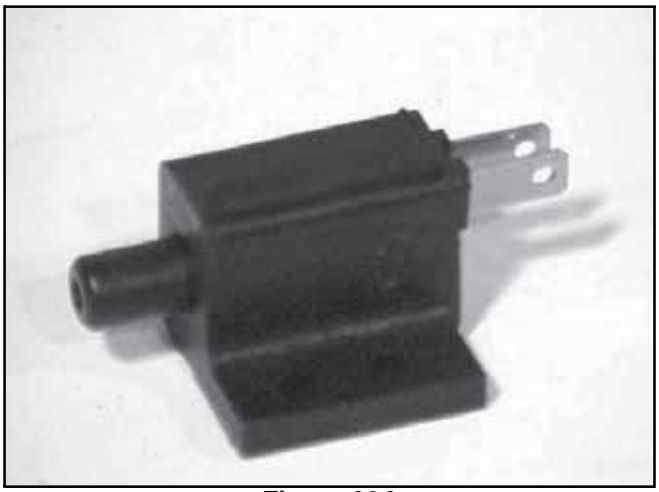


Figure 234 mvc-058x

Testing

This is a normally closed switch; when it is out in your hand there will be continuity between the terminals. Use a ohmmeter to determine if the contacts open and close correctly.

Bail Switch (82-2190)

Purpose

This switch functions as an operator presence control. The operator must maintain a grip on the T-bar to keep the blade clutch running.

Location

The bail switch is located in the center of the T-bar on the upper handle.

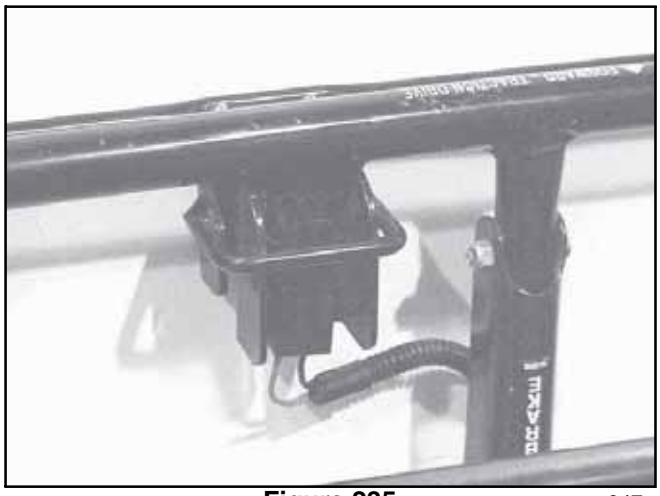


Figure 235 mvc-047x

Testing

Separate the switch from the wire harness. The switch is normally open and closes when the bail is squeezed. Attach an ohmmeter to the switch terminals to determine if the contacts open and close correctly.

Rocker Switch (82-2300)

Purpose

This switch is part of the power supply circuit for the electric clutch on T-bar models. It is depressed only momentarily when you wish to engage the blade.

Location

On the control panel, just below the T-bar.

Figure 236 mvc-886x

Testing

Disconnect the wires from the switch. Attach an ohmmeter to the switch terminals. Continuity should only be present when the switch button is depressed.

Bridge Rectifier

Purpose

A bridge rectifier changes alternating current to direct current.

Location

Under the control panel at the upper handle.

Testing

A bridge rectifier is a box containing 4 diodes. The easiest way to test a bridge rectifier is to disconnect all wires and use an ohmmeter. Select any two terminals that are side by side. Attach the ohmmeter probes and note if continuity is present or not. Now switch the probes. Continuity should be present one way and not the other. Repeat the process for each pair of terminals. If any two terminals register the same when you switch the test probes the bridge rectifier must be replaced.

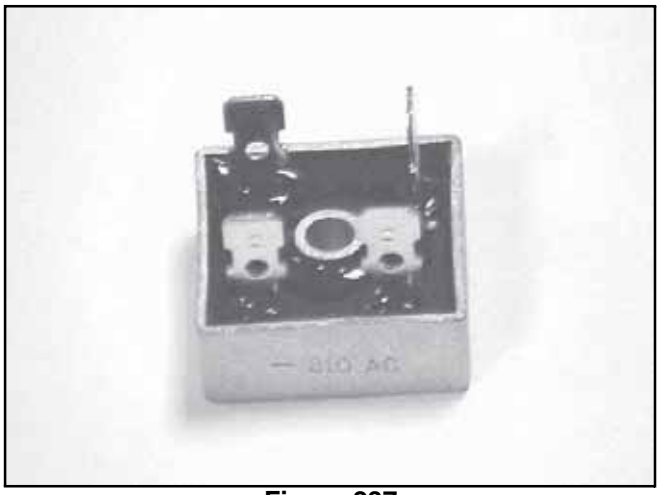


Figure 237 mvc-078

Delay Module (2000 and Earlier)

Purpose

The delay module is part of the electric clutch system. The operator must squeeze a bail to maintain power to the electric clutch. The module allows a slight delay between release of the bail and clutch disengagement. If the module was not there, the operator would need to restart the clutch even if their hand slipped off momentarily. The module allows about a second delay.

Location

The module is located under the control panel on the upper handle.

Testing

There is no process to test the module. In fact, an ohmmeter connected to the wrong terminals can cause internal damage. Disconnect the module from the circuit before using an ohmmeter or continuity light. Test the wires and switches, if they are good and the problem persists, replace the module.

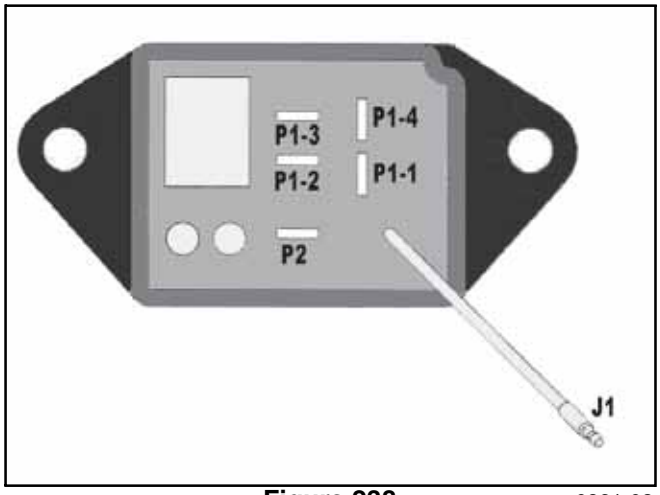


Figure 238 0821-03

Delay Module 104-8141 (T-Bar Floating Deck Electric Clutch 2001 & Up)

Purpose

The delay module monitors the status of the interlock system and prevents engagement of the electric clutch if it detects an unsafe condition.

How It Works

DC voltage is connected to the common terminal of a relay located on the module. Pressing the PTO momentary switch energizes the relay which then supplies power to the electric clutch. The relay remains energized as long as the bail switch is closed. If the operator releases the bail, the relay will de-energize after a .5 (half) second delay and remove power from the electric clutch.

P2 is the outlet for an hourmeter for non-electric start mowers. Some modules with electric start may not have P2 terminal.

Testing

Test module at full throttle when the hourmeter and module are connected with the engine running at full throttle.

1. Connect a DC voltmeter between terminals P1-2 (pos) and P1-1 (neg).
2. Connect the positive lead from a 12 VDC power source to P1-3 and the negative lead to P1-1.
3. Connect a jumper lead from P1-4 to J1.
4. Start mower and run at full throttle when testing.
5. Connect a second jumper lead to terminal P1-3 and momentarily touch it to P1-4. The voltmeter should now read 12 volts.
6. Disconnect the jumper from J1. The meter should read 0 volts after .5 (half) second.

Testing the Hourmeter

Test the hourmeter at the P2 terminal of the module when the engine is at full throttle (non-electric start models). Measure the VDC output from P2 when the hourmeter and module are connected to the wire harness.

1. Connect a DC voltmeter between terminals P2 (pos) to P1-1 (neg).

A minimum of 7 VDC at the P2 terminal would be normal output to the hourmeter.

Interlock Module

Purpose

An interlock module controls spark to the engine. When engine is off, the module grounds the magneto. When the starter rope is pulled or the electric starter engaged the engine magneto will begin to create current. The module takes a very small amount of that current and sends it out to a sensing circuit. If the safety switches in that circuit are in the safe position, the current can return to the module. The module recognizes this as a safe condition and removes the magneto ground, allowing the engine to start.

Once the engine is started, the module requires blade disengaged/transmission in neutral or the operator is holding the operator presence control. This prevents the operator from leaving the operator position with the blade engaged or the transmission is in gear.

Location

The interlock module is connected to the wire harness in the upper handle/ control panel area.

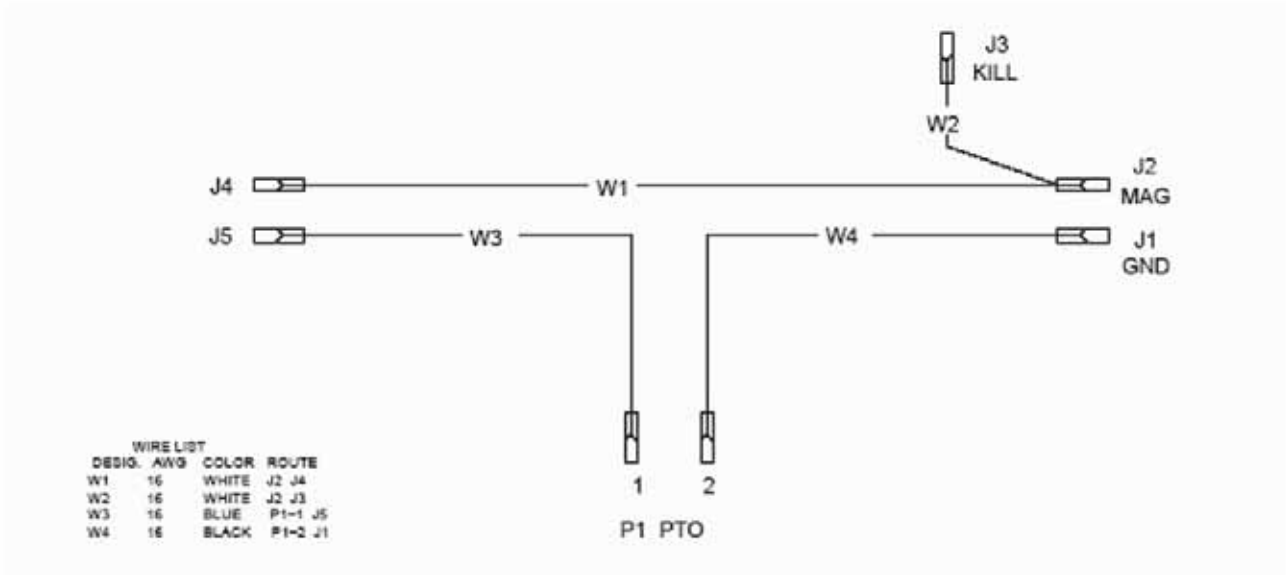
Figure 239 mvc-052x

Testing

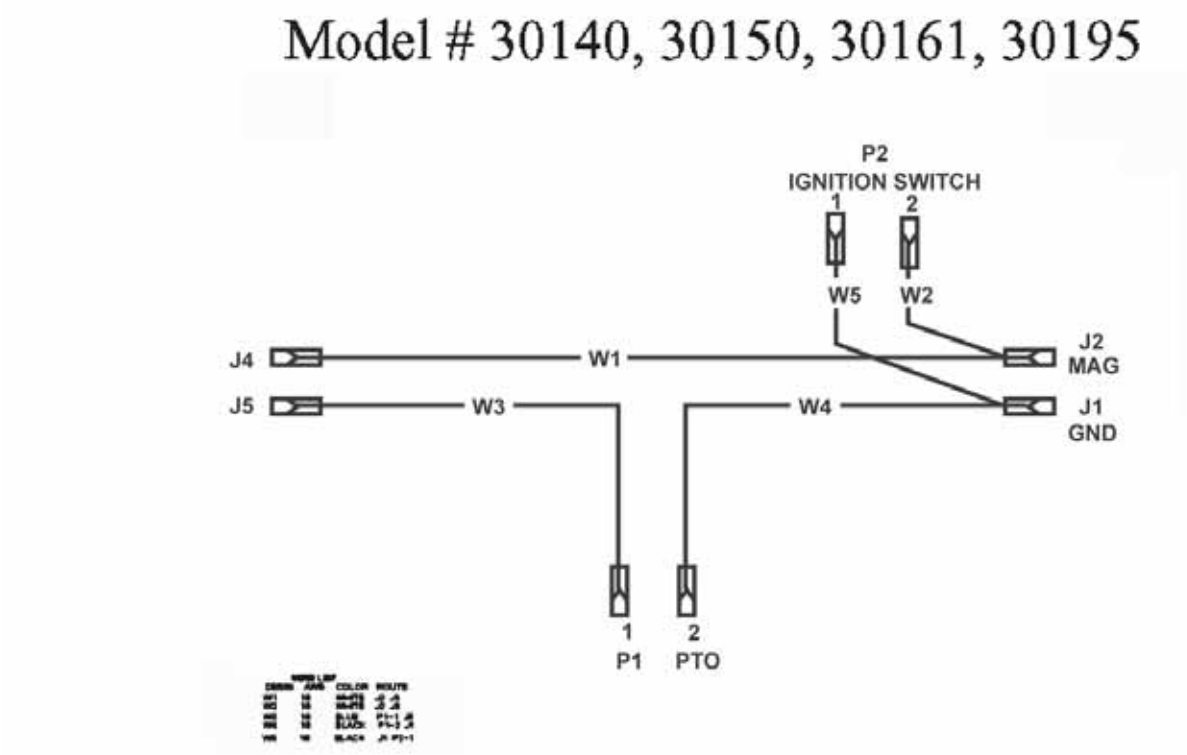
Like the delay module the interlock module can be damaged by a continuity light or ohmmeter. Disconnect the module and test the switches and wiring. If they are good and the problem persists, replace the module.

T-Bar (Fixed Deck - Gear)

Model # 30164

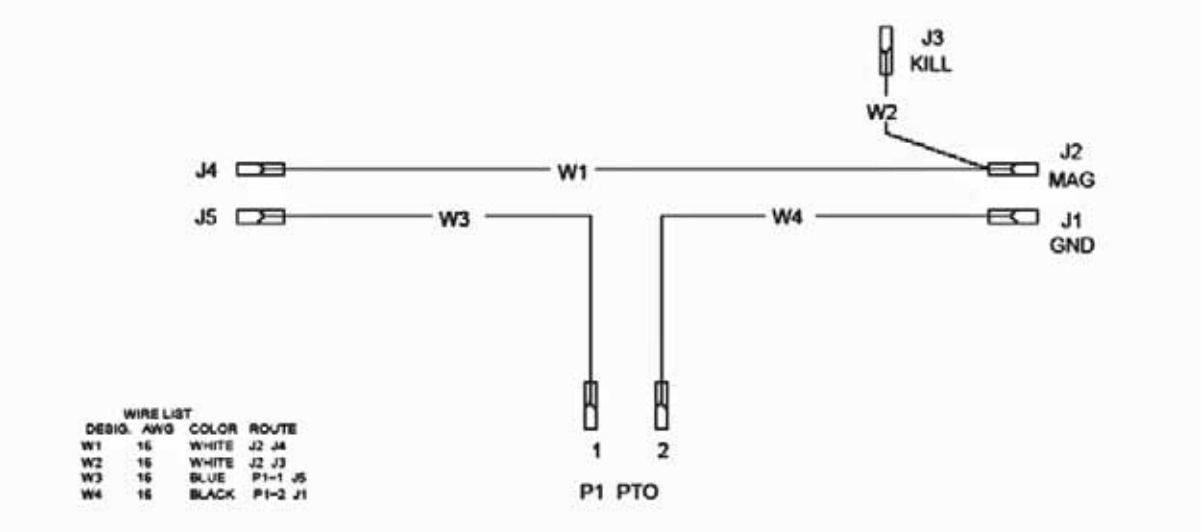


T-Bar (Fixed Deck - Gear)



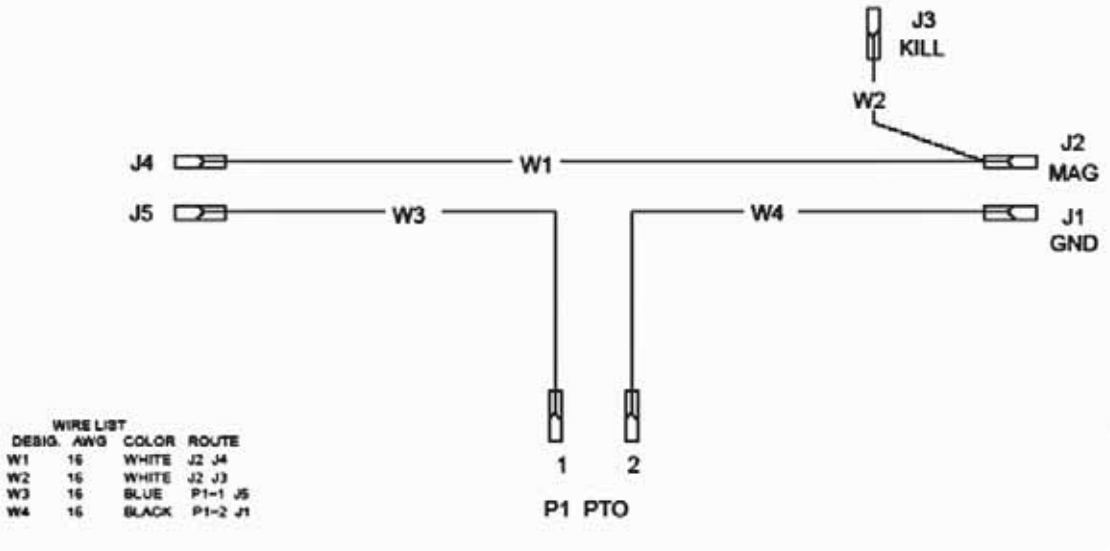
T-Bar (Fixed Deck - Gear)

Model # 30171, 30193, 30196



T-Bar (Fixed Deck - Gear)

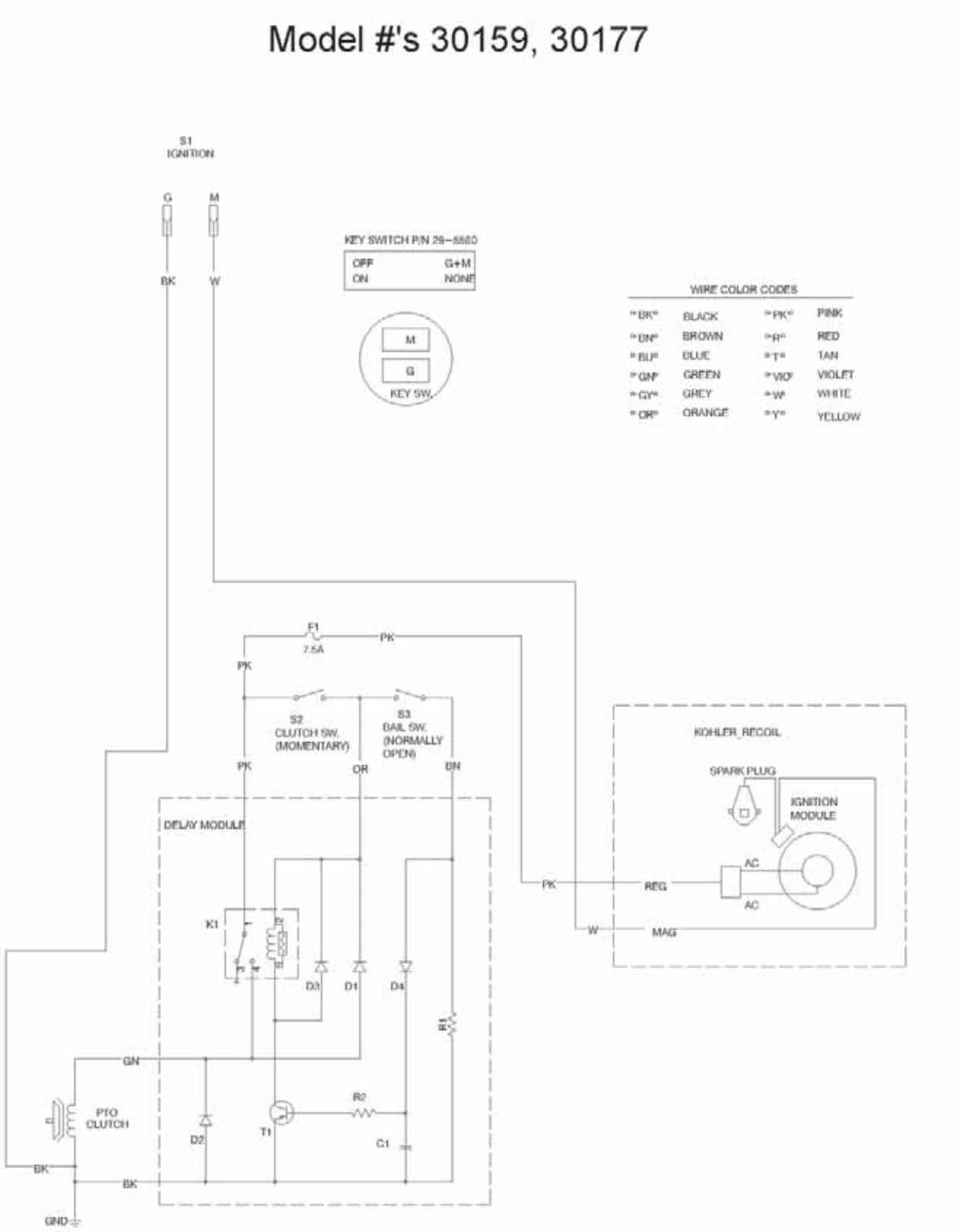
Model # 30178, 30184, 30194, 30197



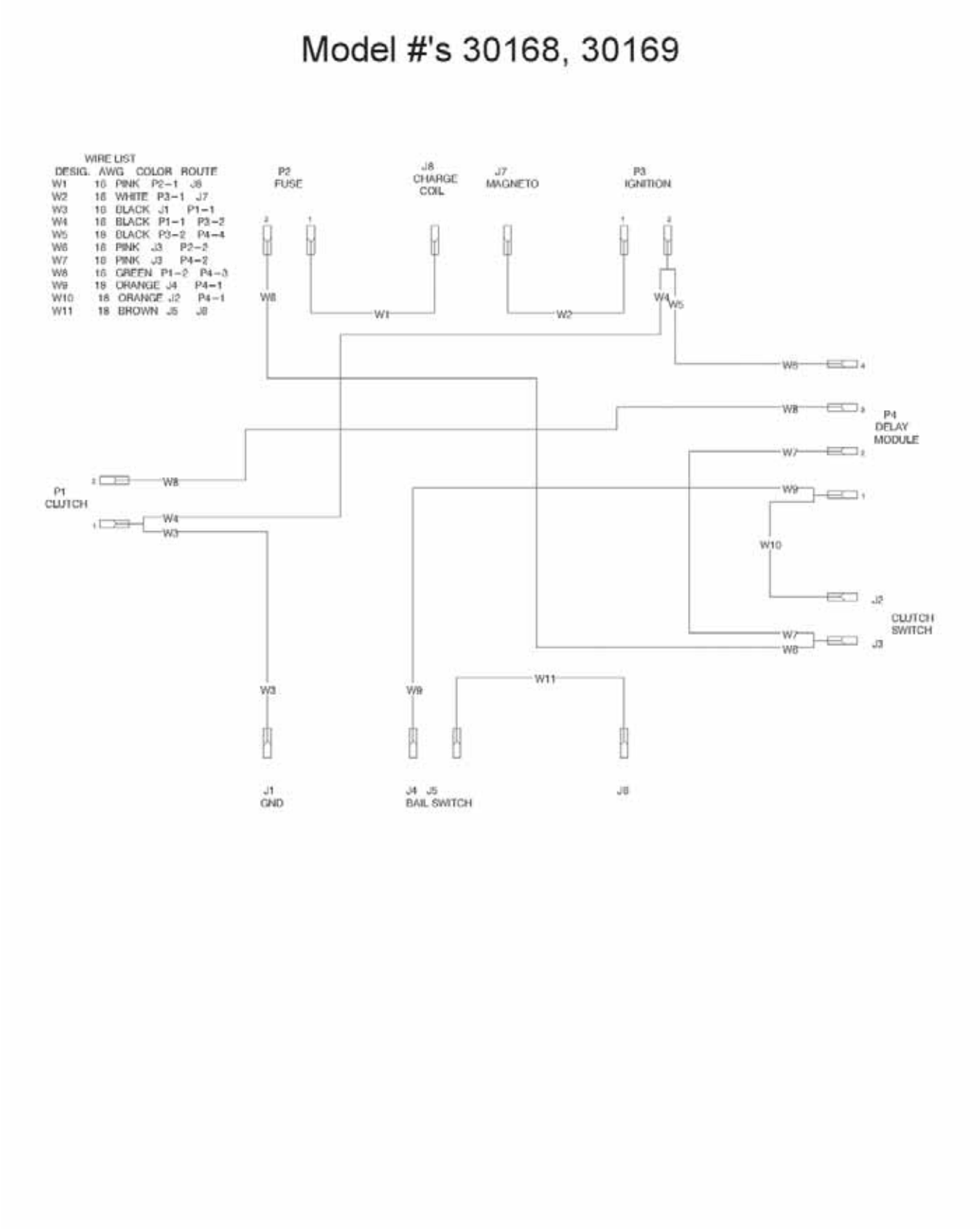
WIRE LIST

DESIG.	AWG	COLOR	ROUTE
W1	16	WHITE	J2 J4
W2	16	WHITE	J2 J3
W3	16	BLUE	P1-1 J5
W4	16	BLACK	P1-2 J1

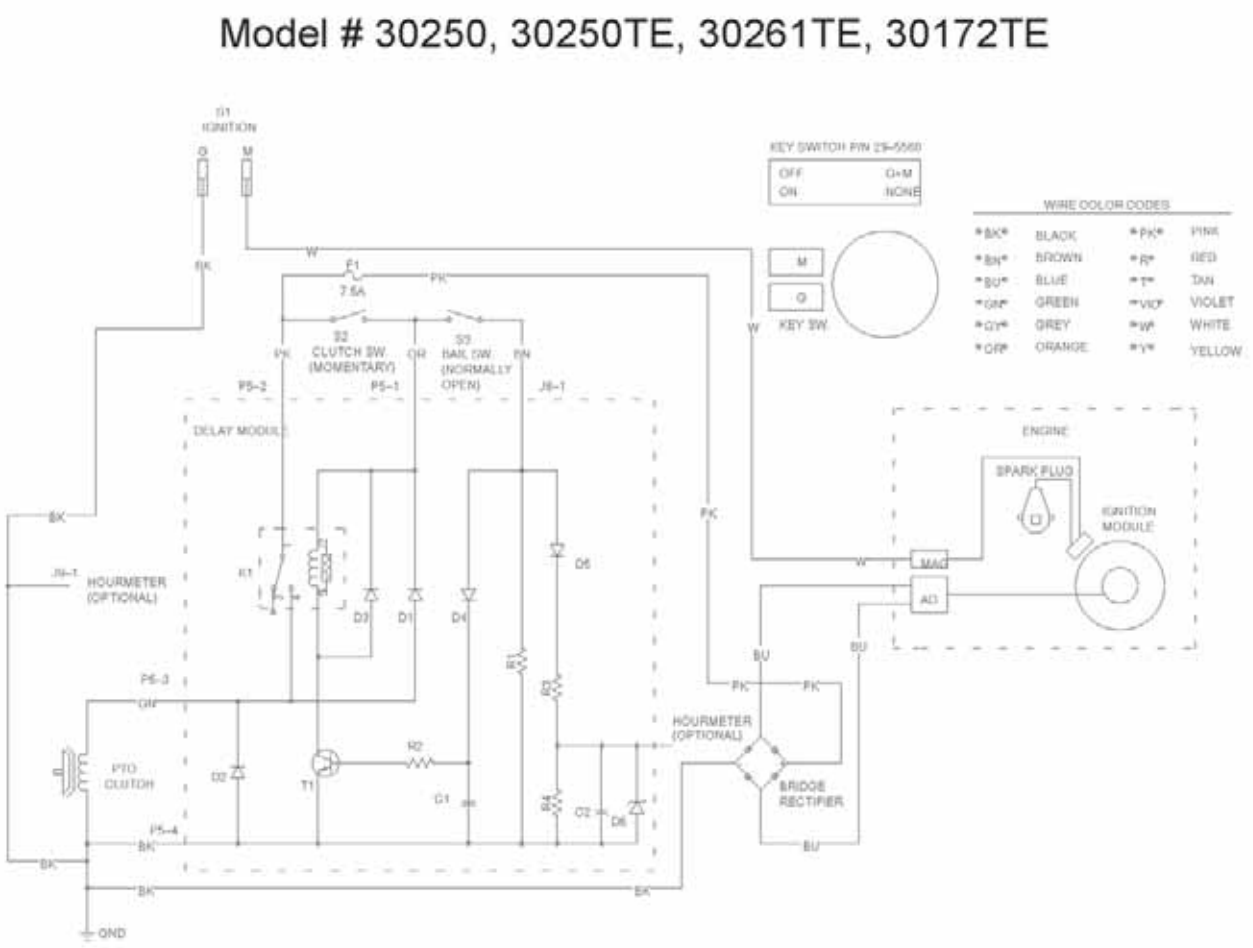
T-Bar (Floating Deck - Gear)



T-Bar (Floating Deck - Gear)

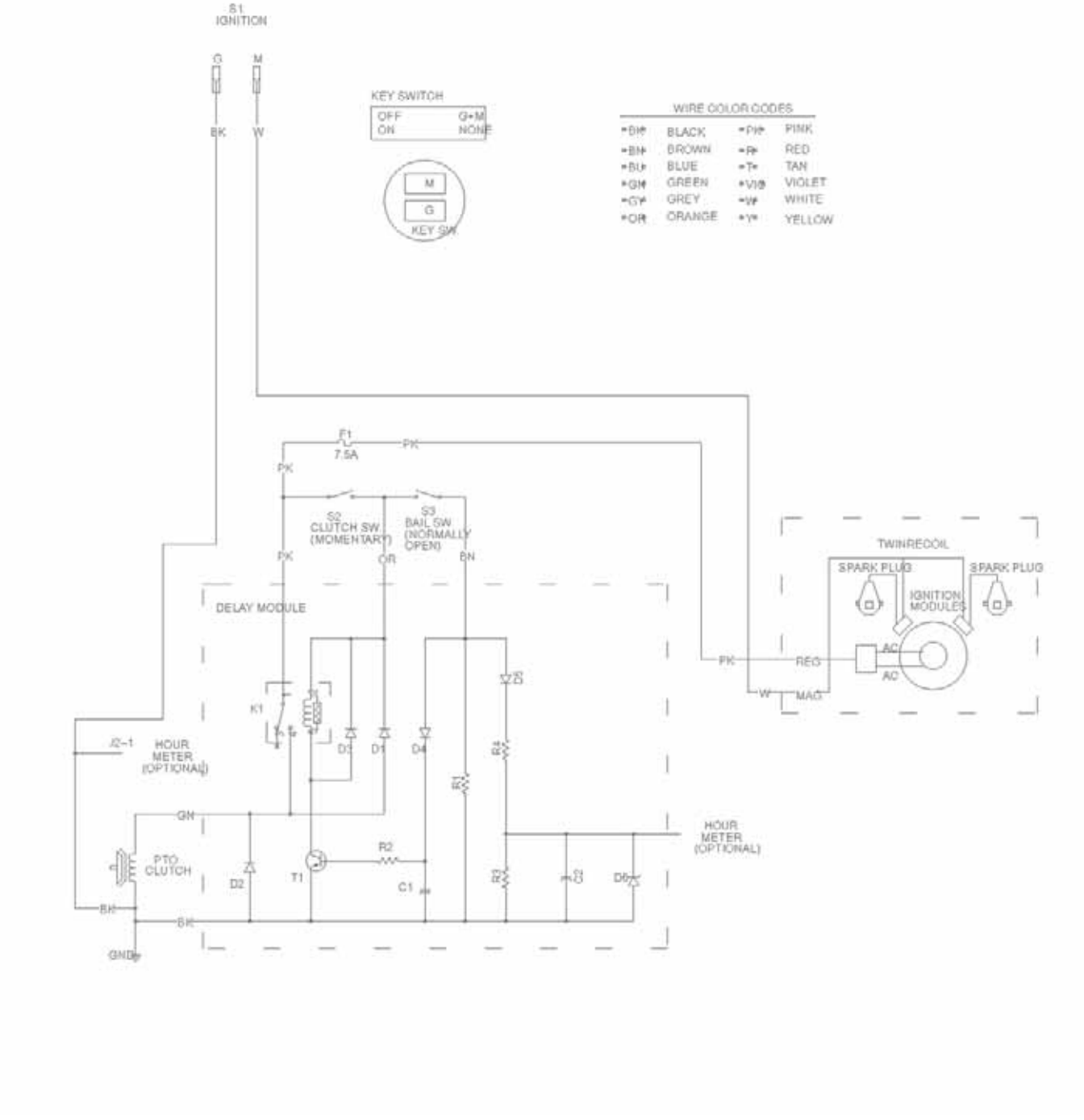


T-Bar (Floating Deck - Gear)



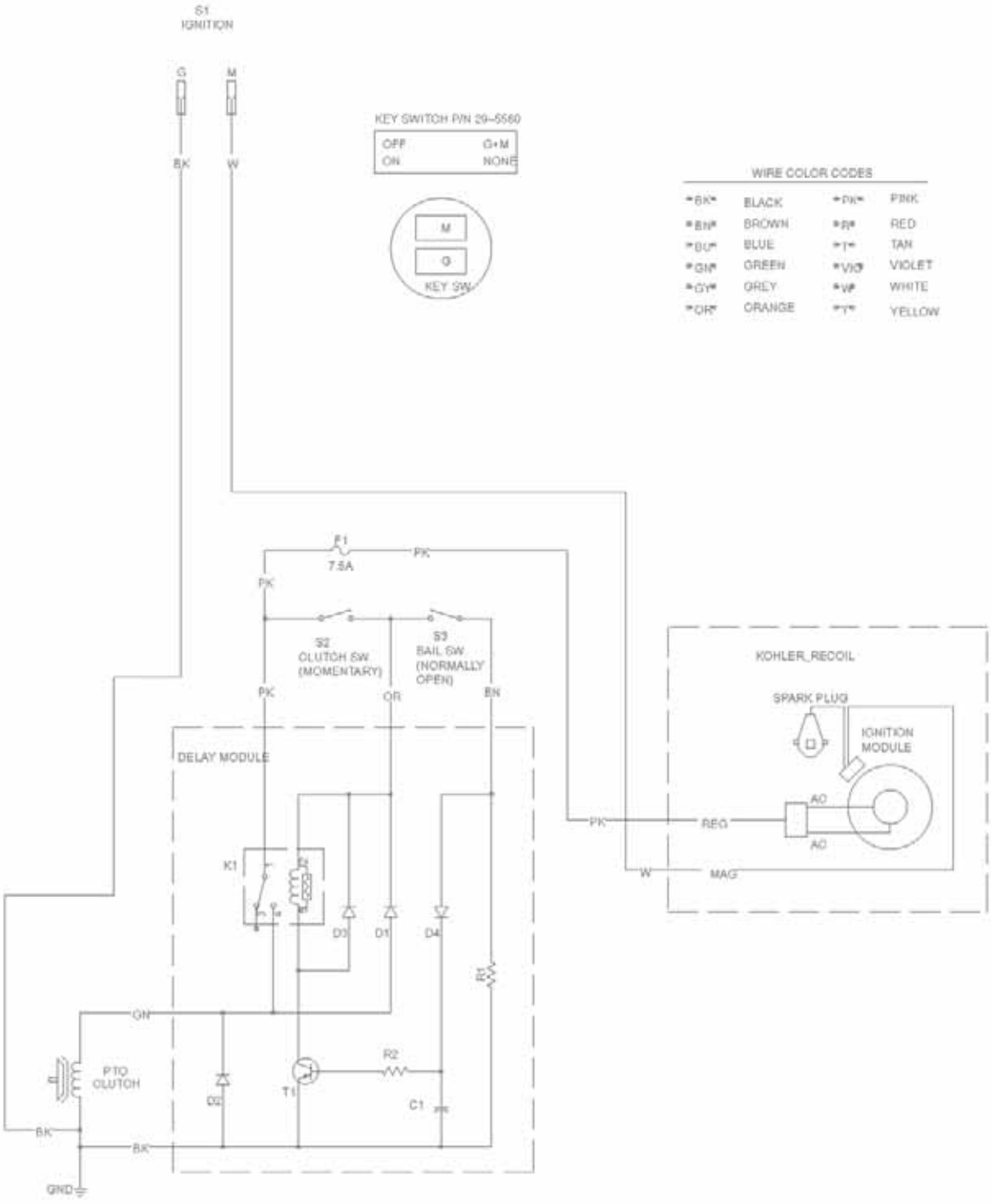
T-Bar (Floating Deck - Gear)

Model #'s 30257, 30258, 30259, 30260,
30314, 30320 30321, 30322, 30326, 30327, 30342

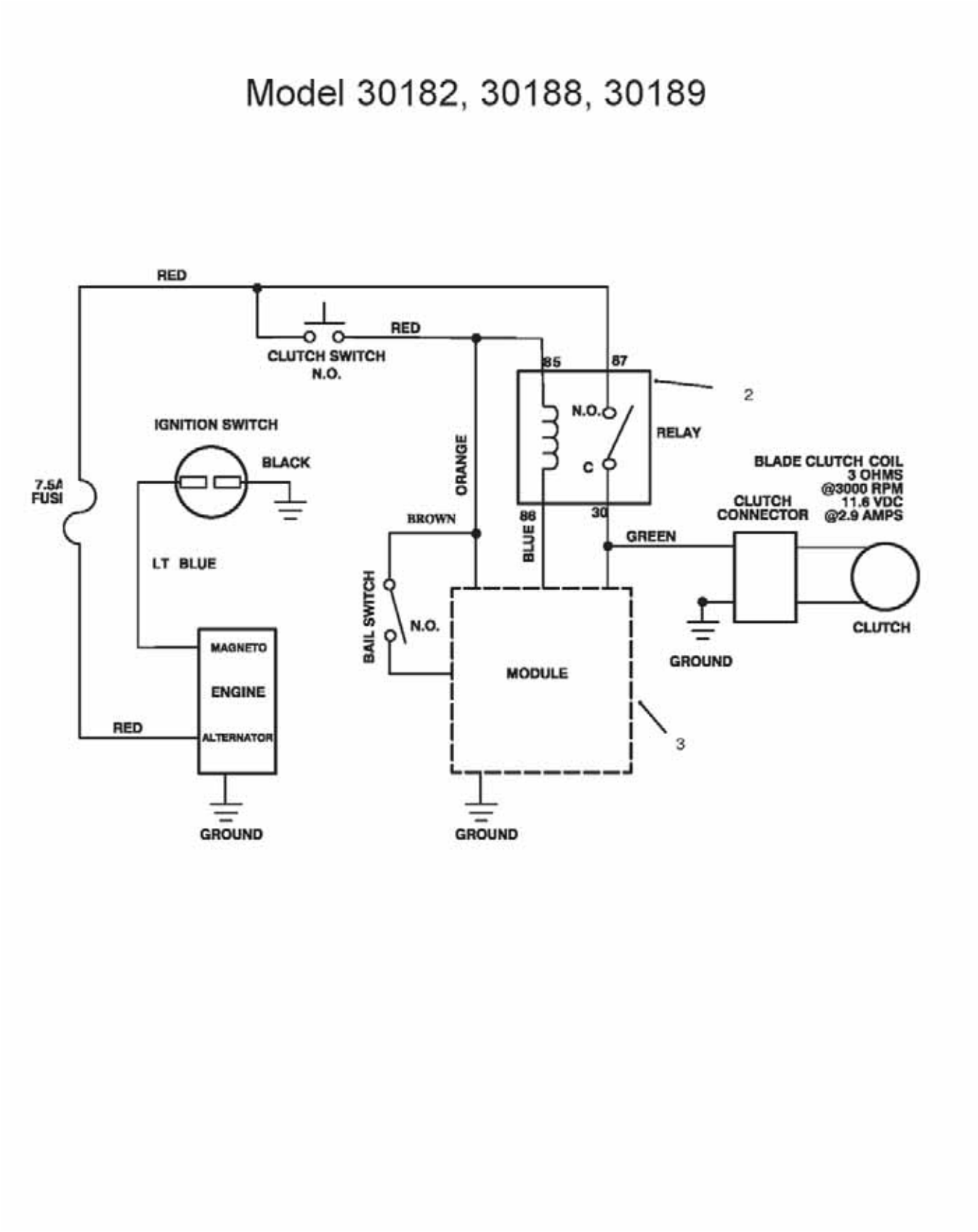


T-Bar (Floating Deck - Gear)

Model #'s 30252, 30253, 30254, 30255,
30316, 30317, 30318, 30319

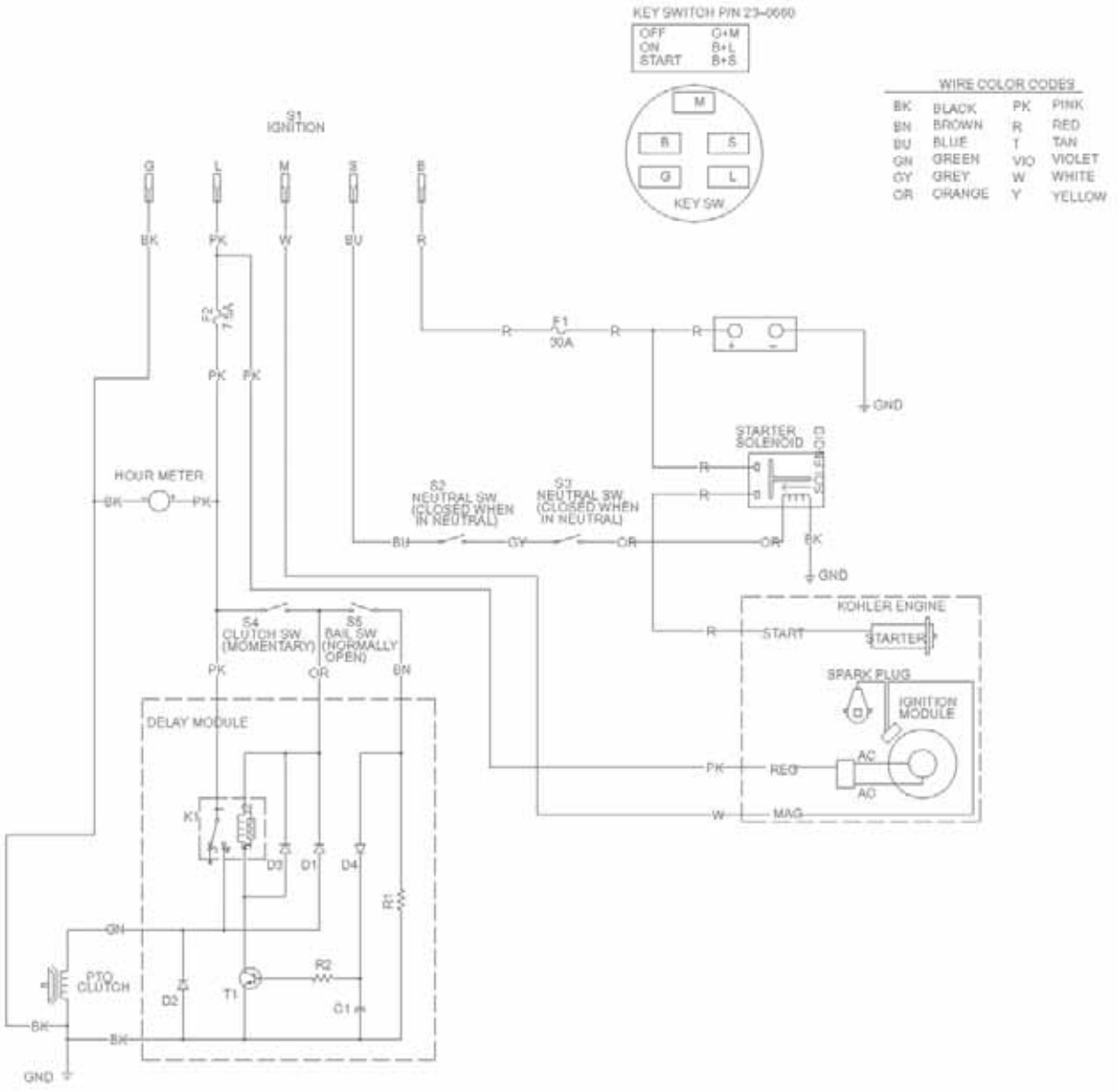


T-Bar (Floating Deck - Gear and 1988 / 1999 Hydro)

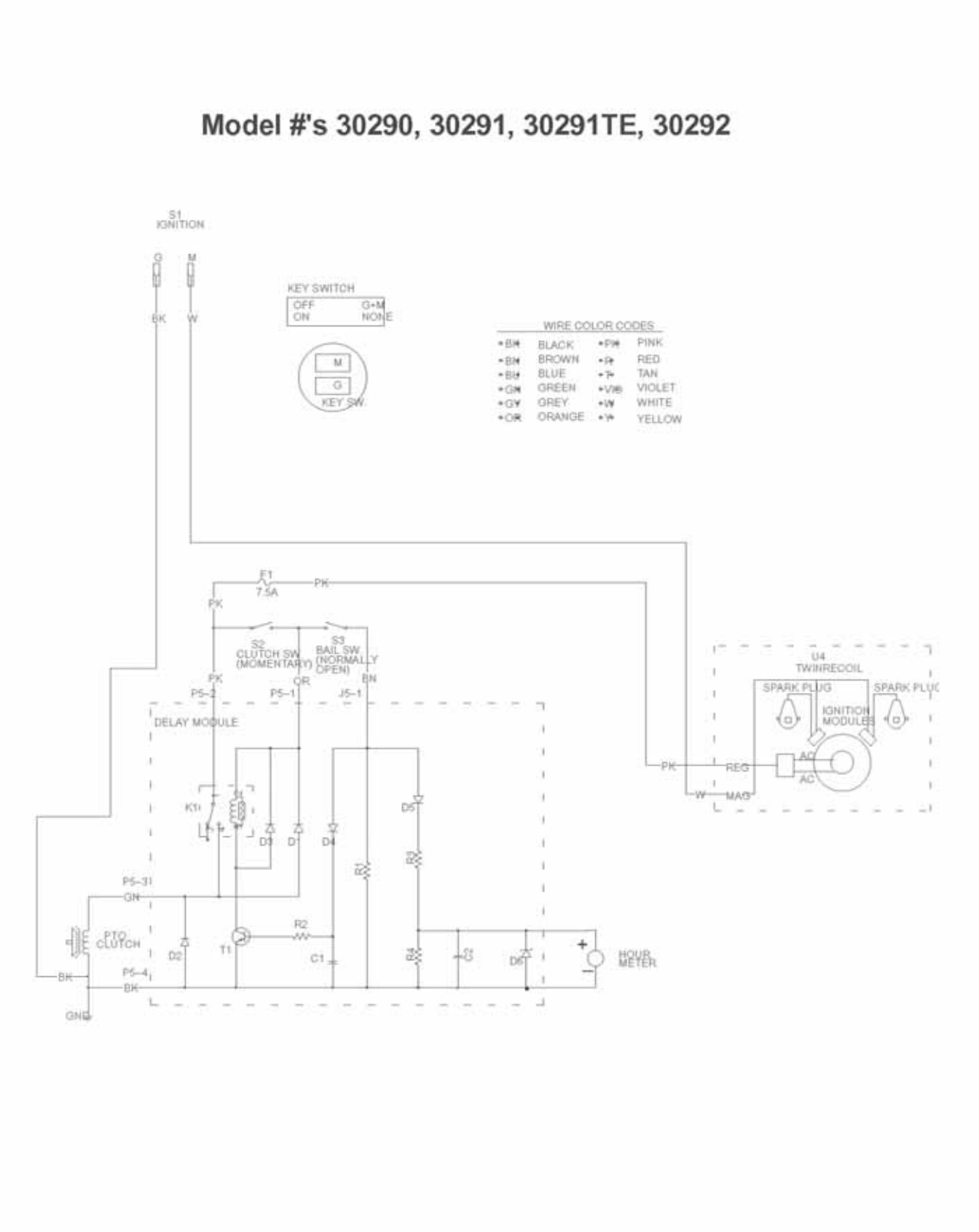


T-Bar (Floating Deck - Hydro)

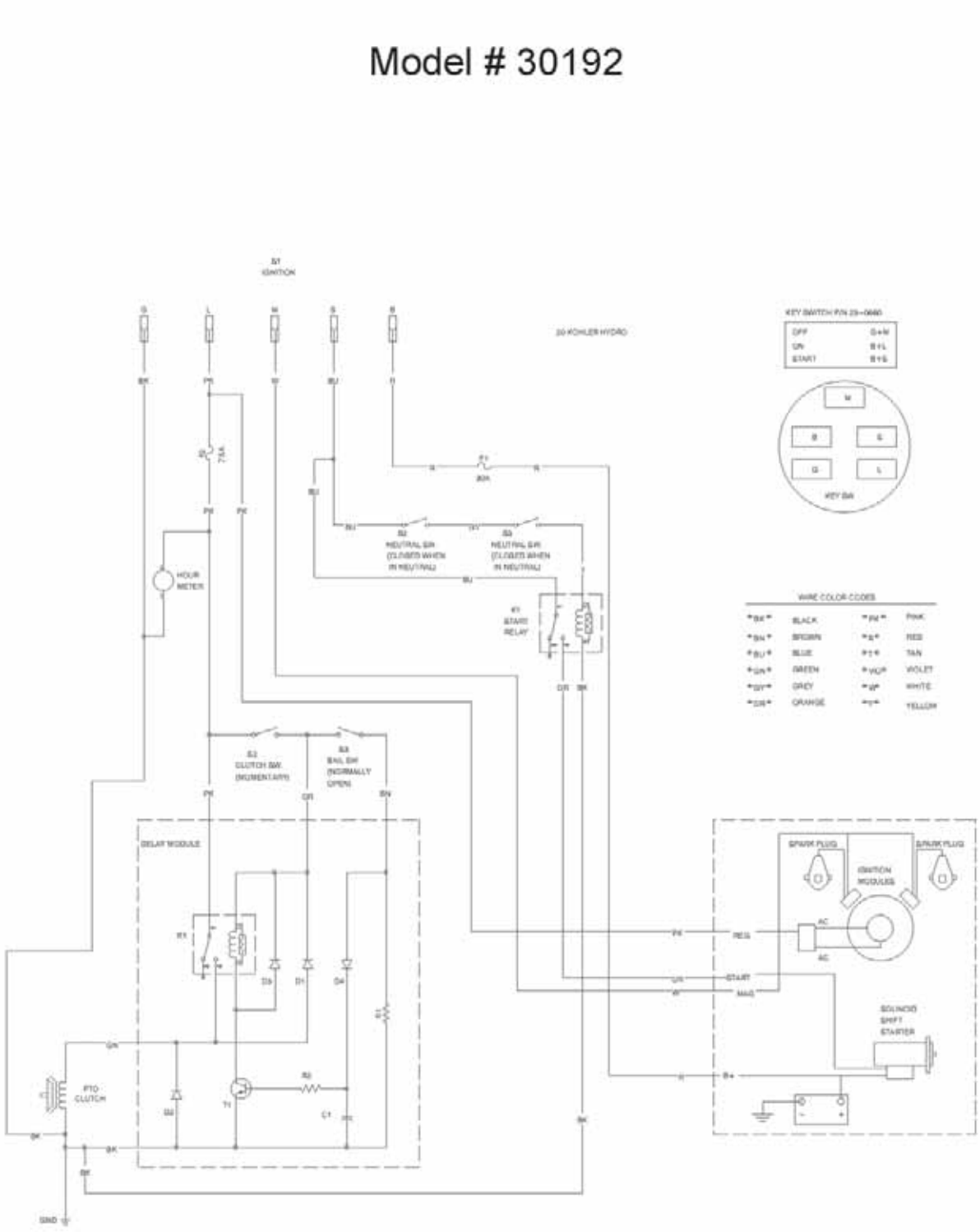
Model # 30187



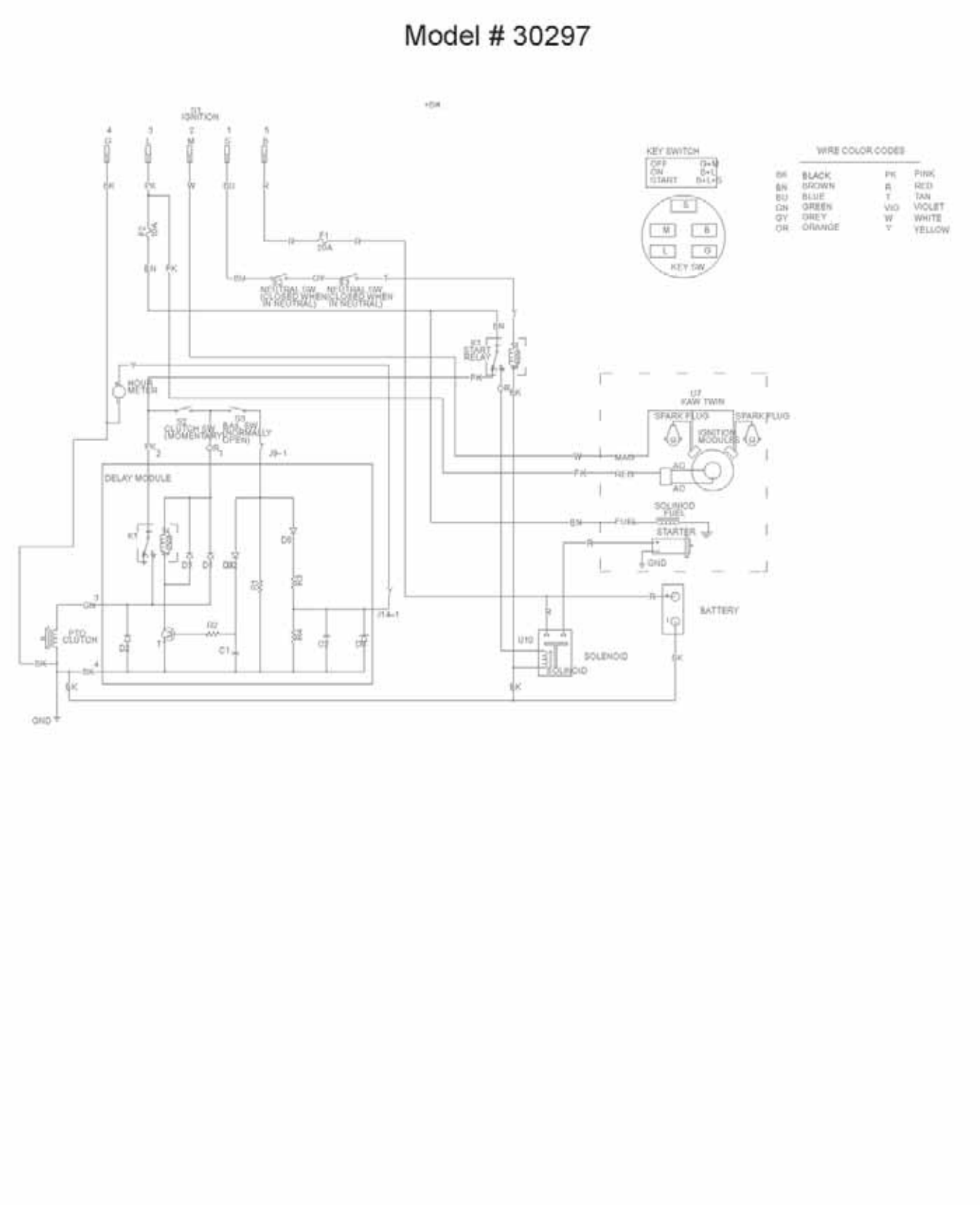
T-Bar (Floating Deck - Hydro)



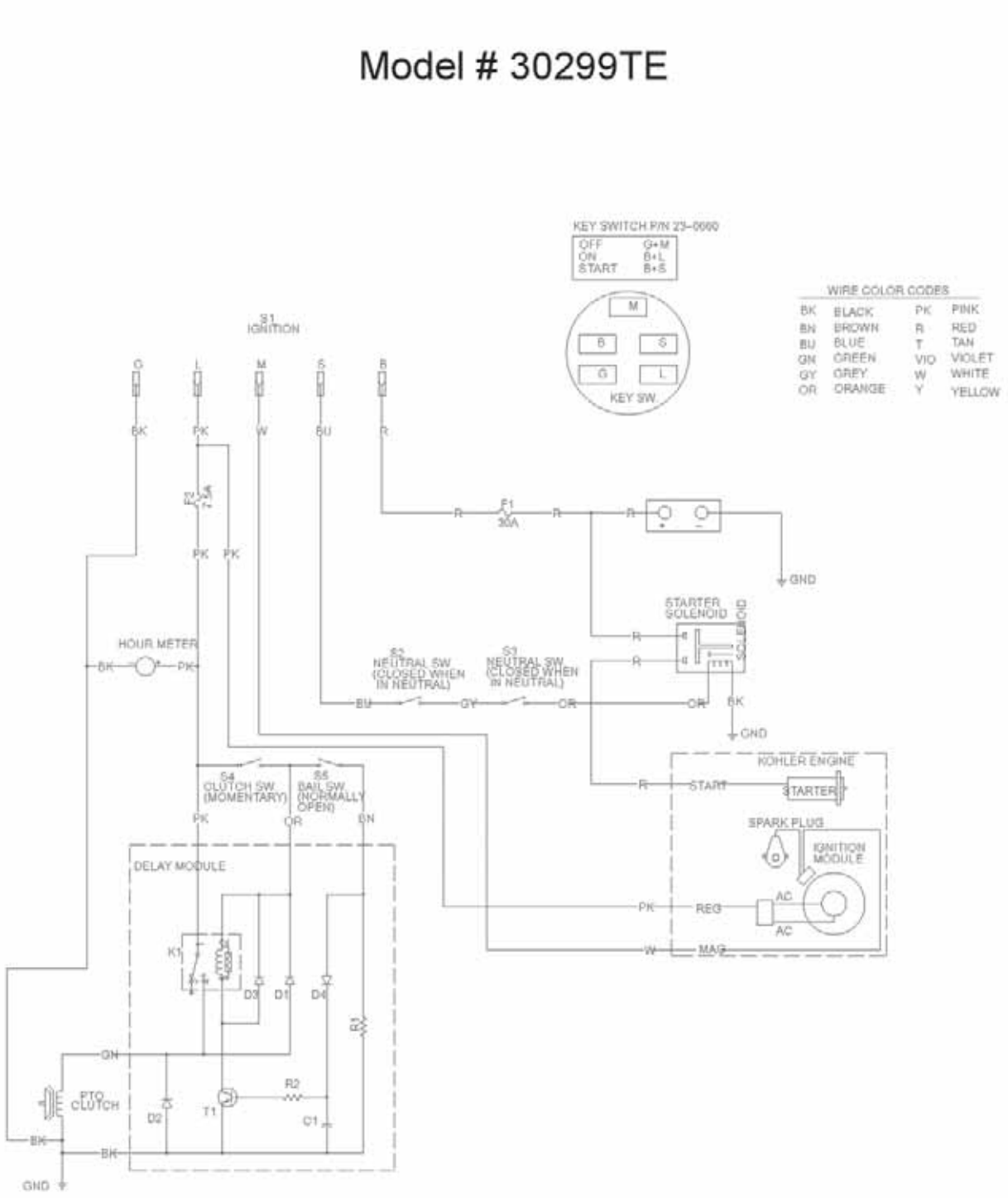
T Bar (Floating Deck - Hydro)



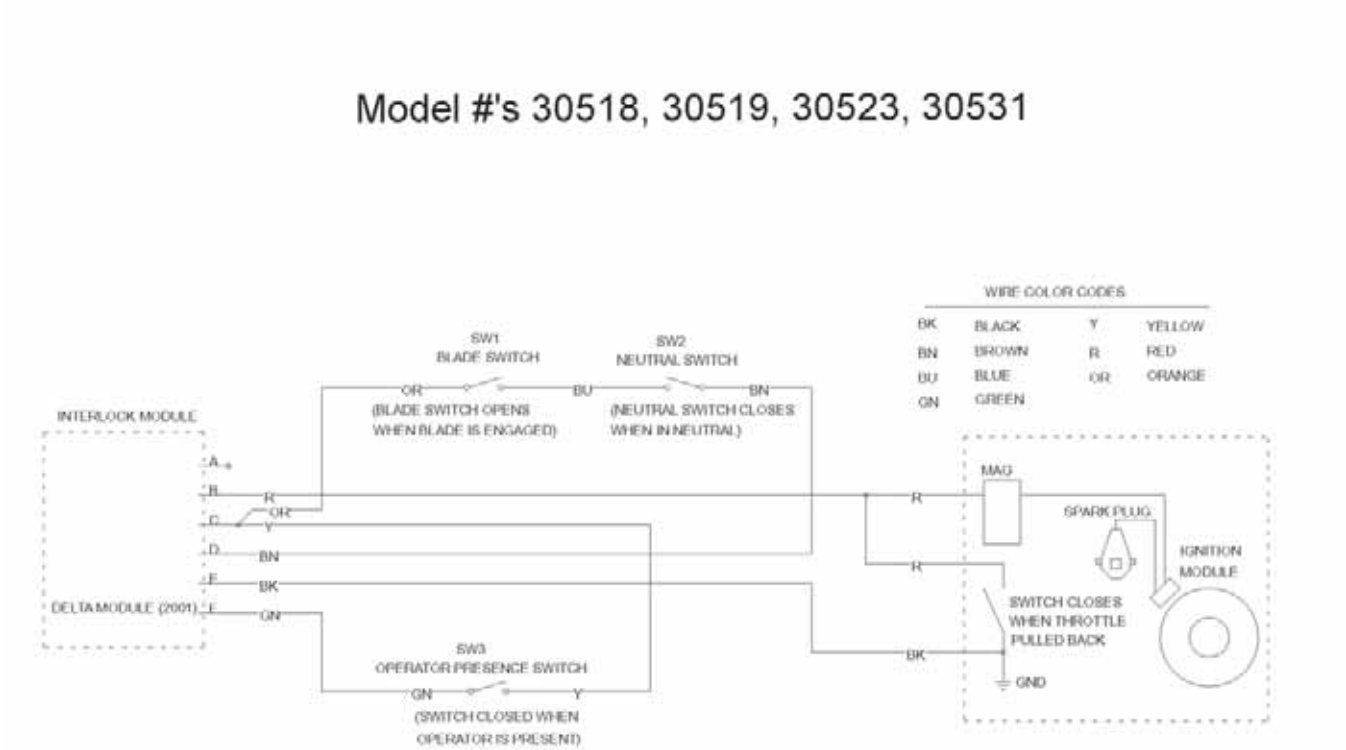
T-Bar (Floating Deck - Hydro)



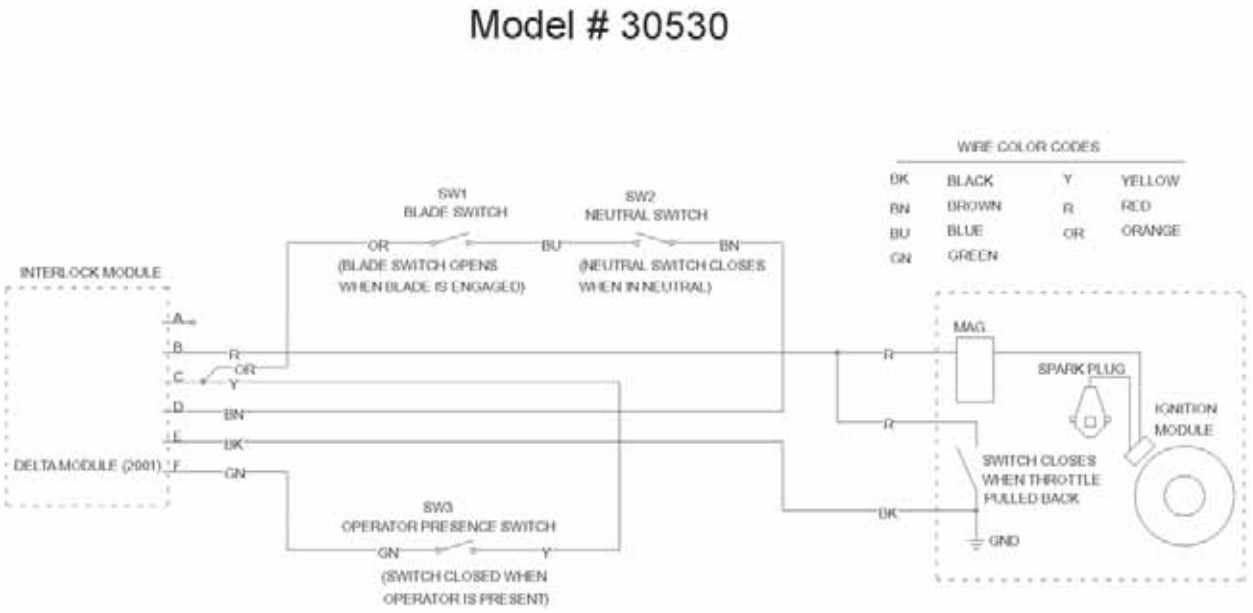
T-Bar (Floating Deck - Hydro)



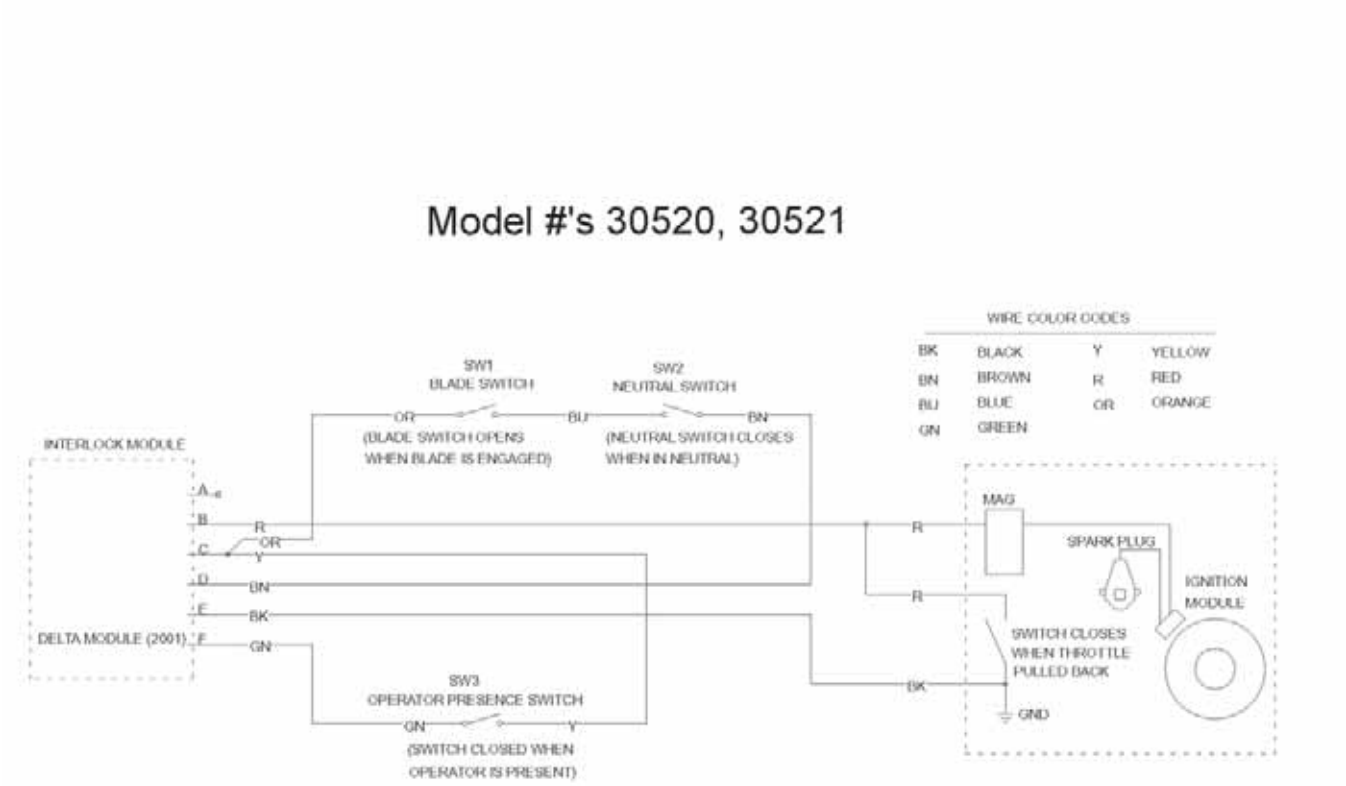
Pistol Grip (Fixed Deck - Gear)



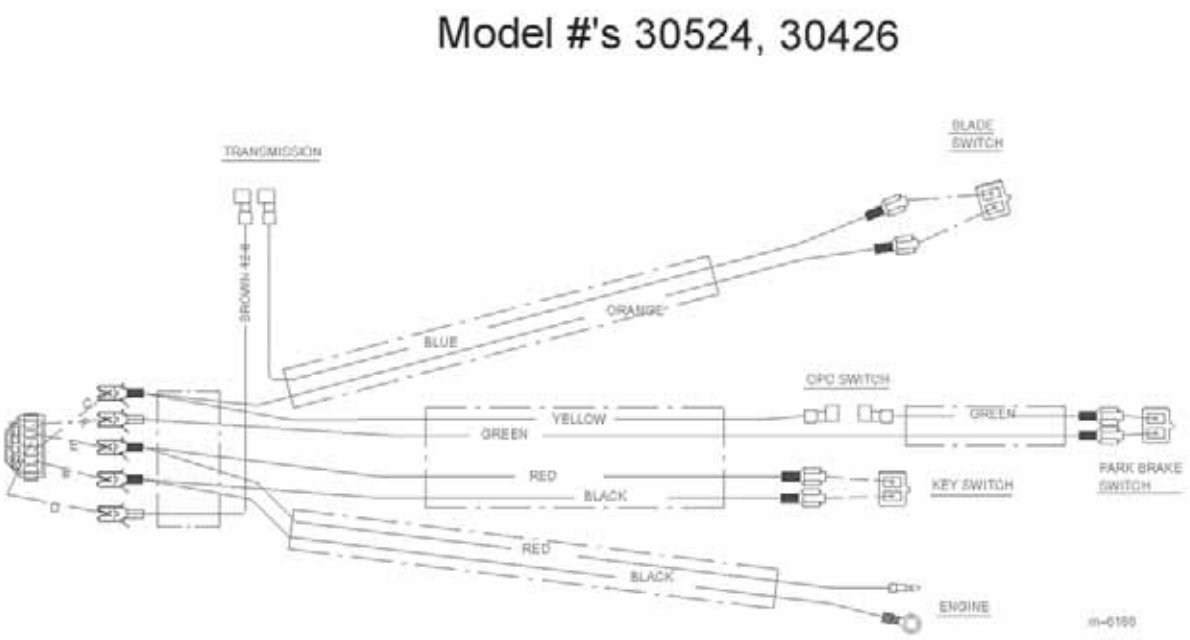
Pistol Grip (Fixed Deck - Gear)



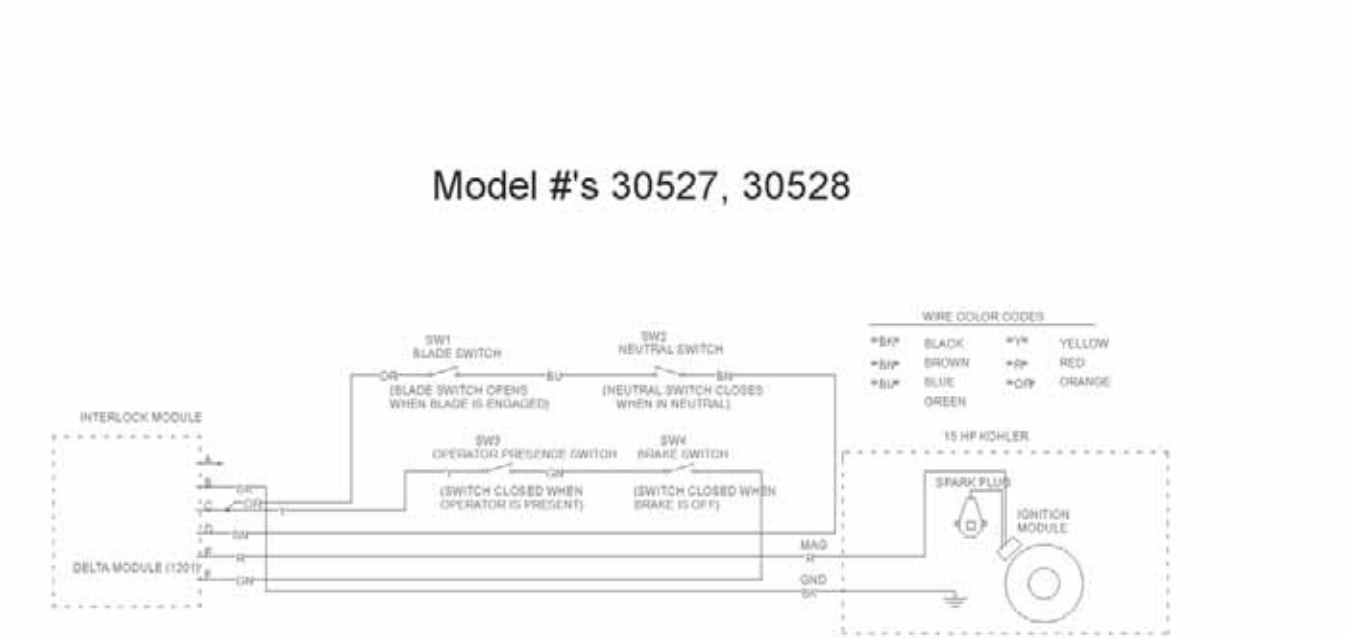
Pistol Grip (Fixed Deck - Gear)



Pistol Grip (Fixed Deck - Hydro)

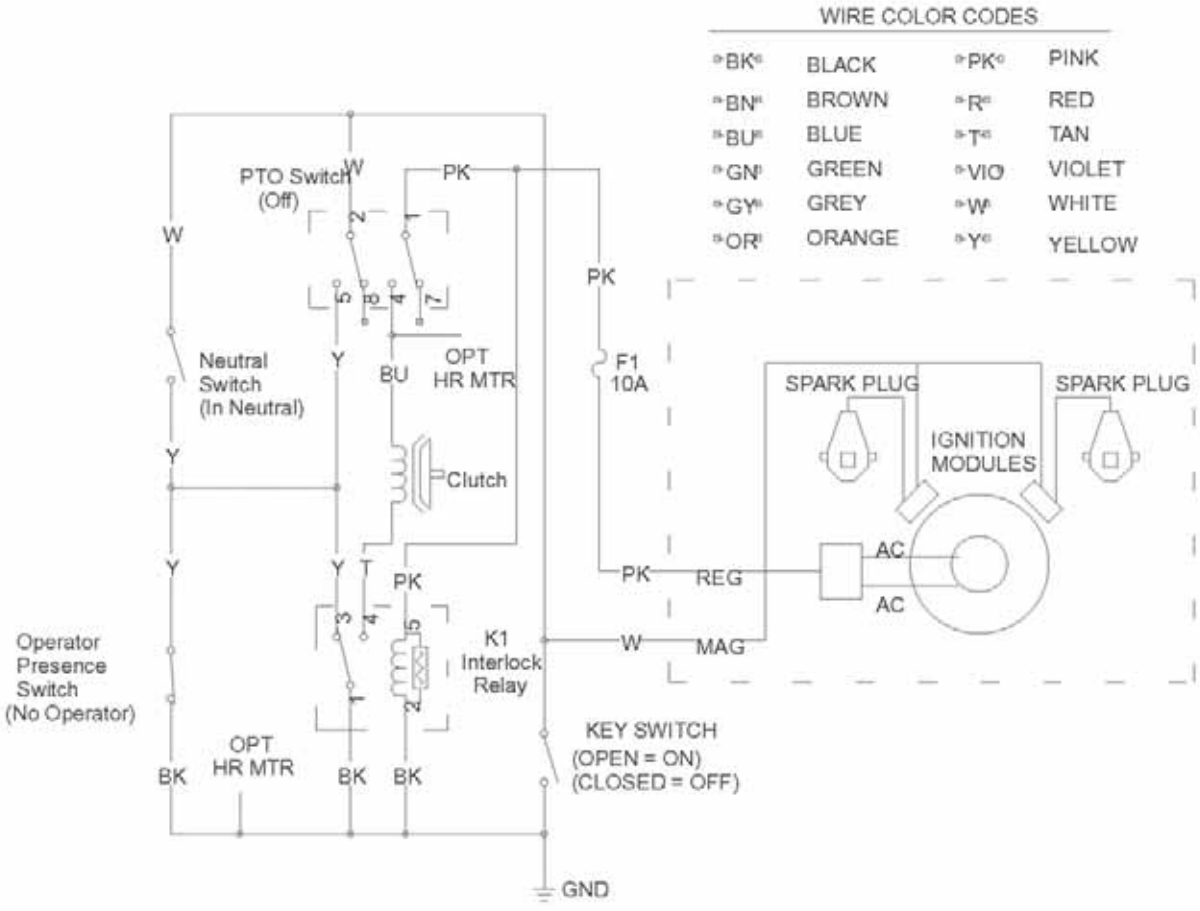


Pistol Grip (Fixed Deck - Hydro)



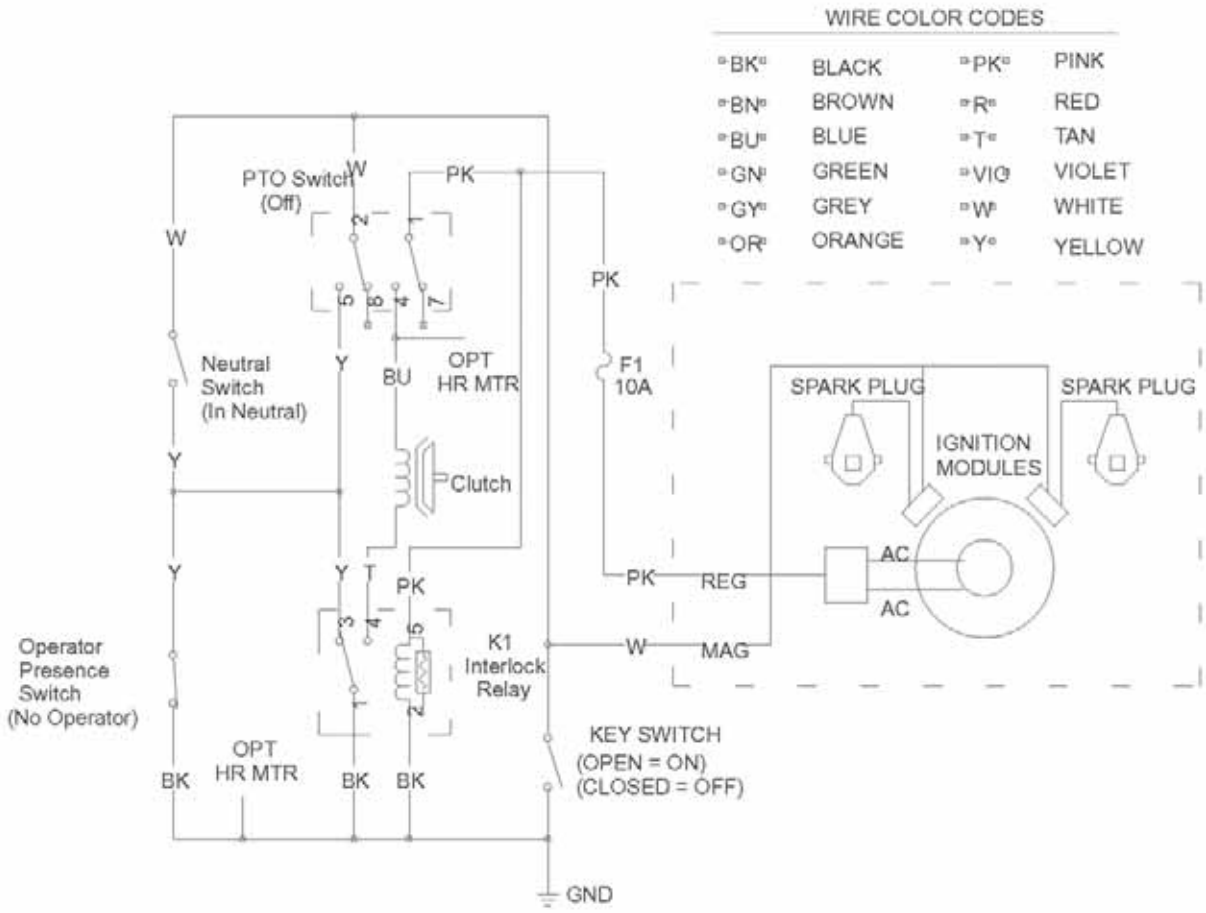
Pistol Grip (Floating Deck - Gear)

Model #'s 30329, 30430



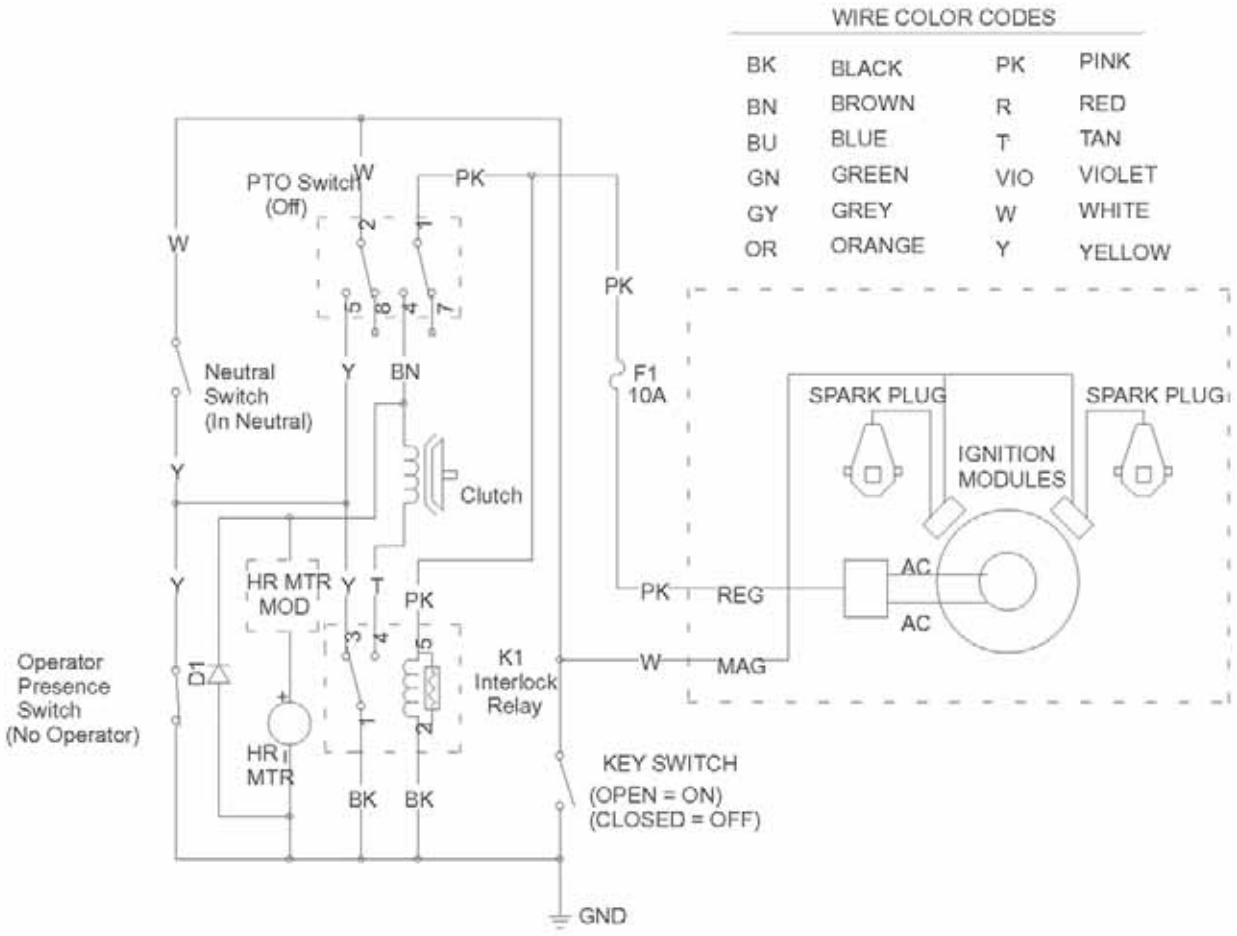
Pistol Grip (Floating Deck - Gear)

Model #'s 30332, 30333, 30334, 30431, 30432, 30437, 30438



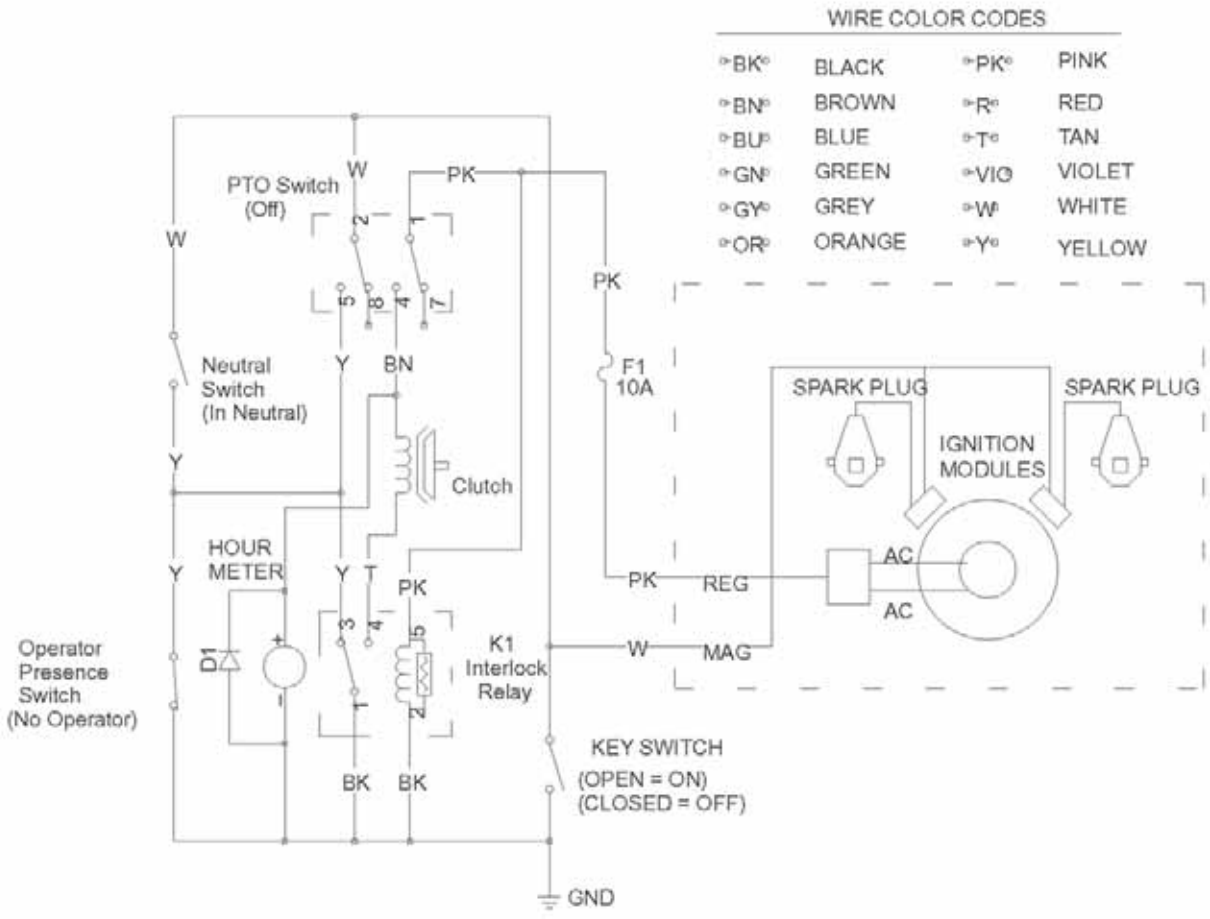
Pistol Grip (Floating Deck - Hydro)

Model # 30335

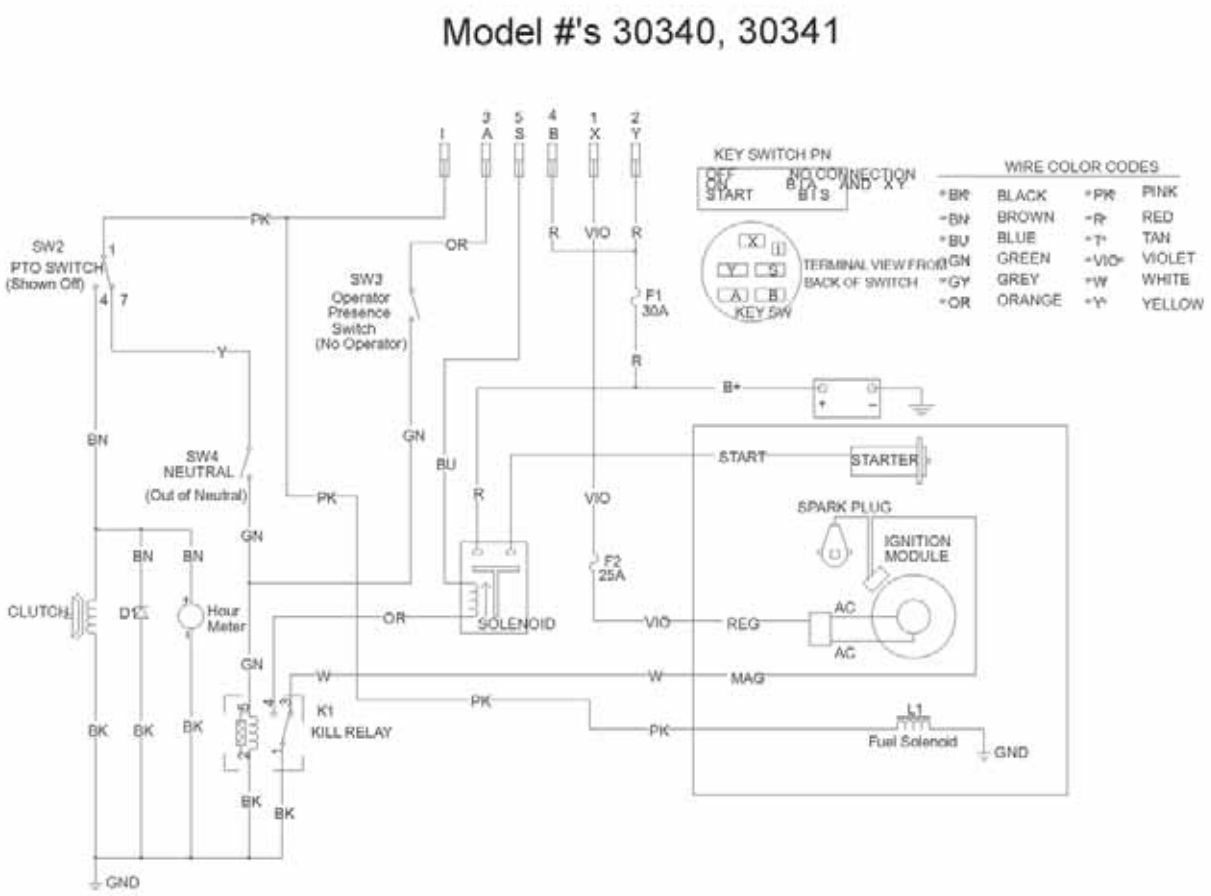


Pistol Grip (Floating Deck - Hydro)

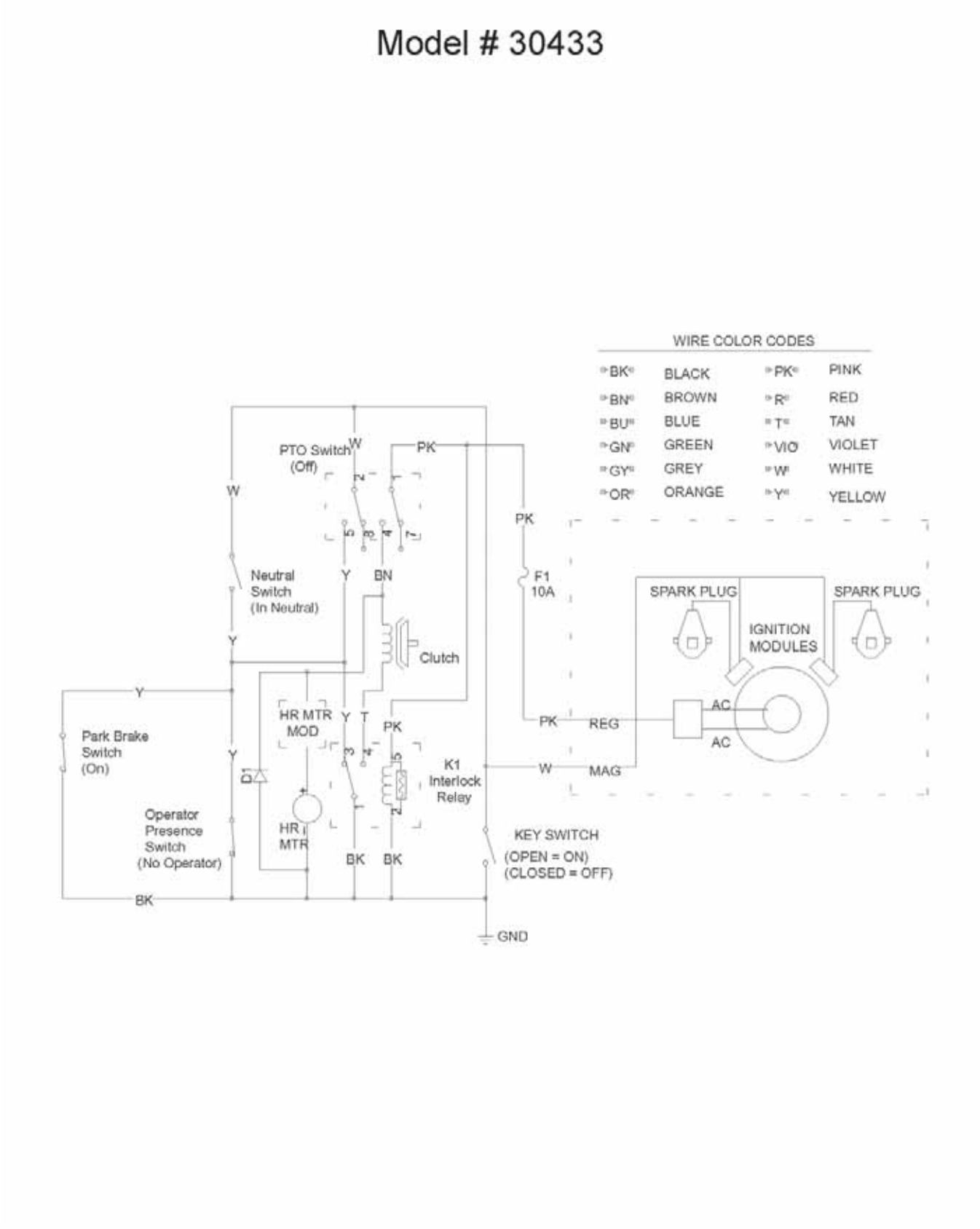
Model #'s 30338, 30339



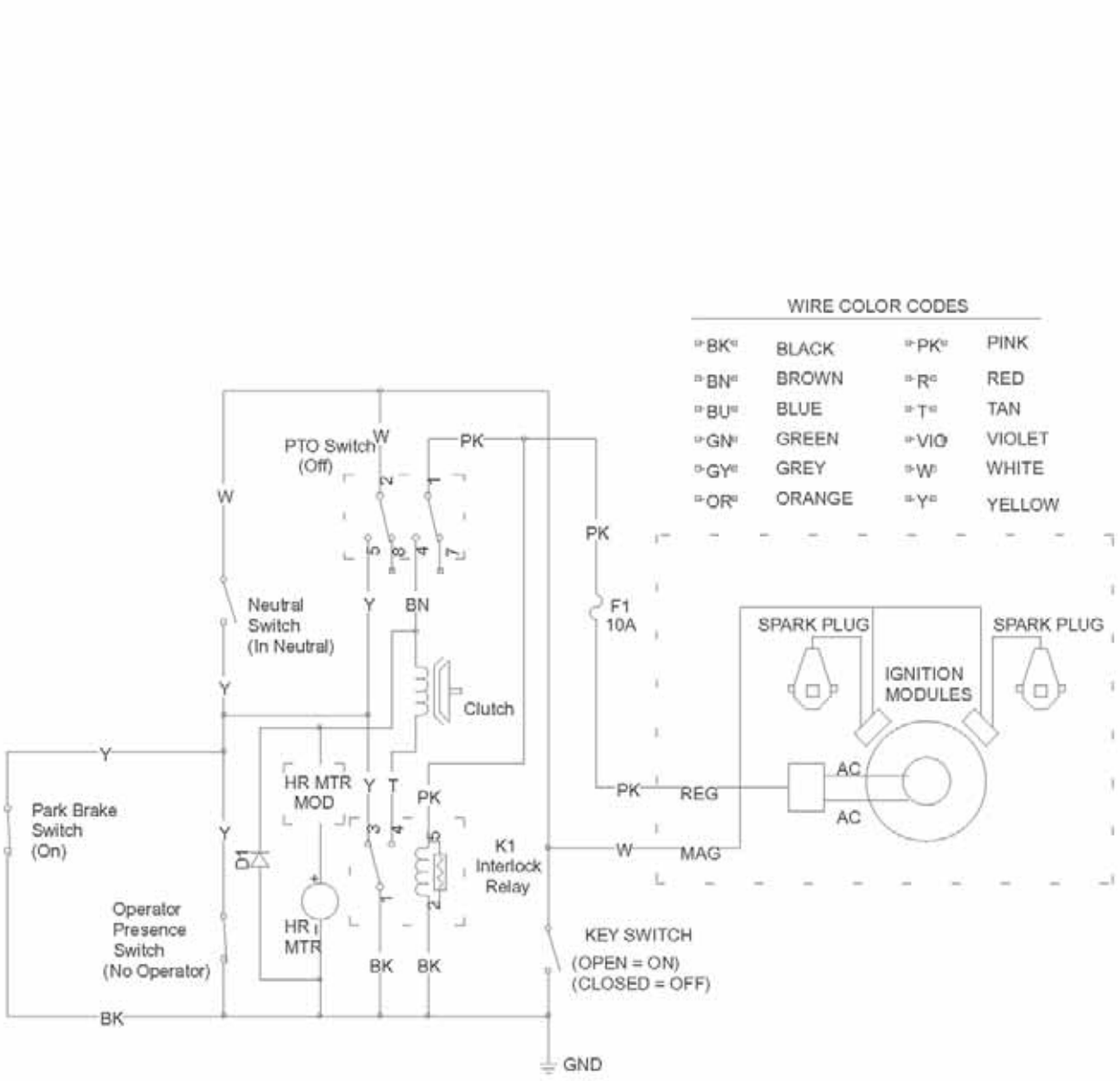
Pistol Grip (Floating Deck - Hydro)



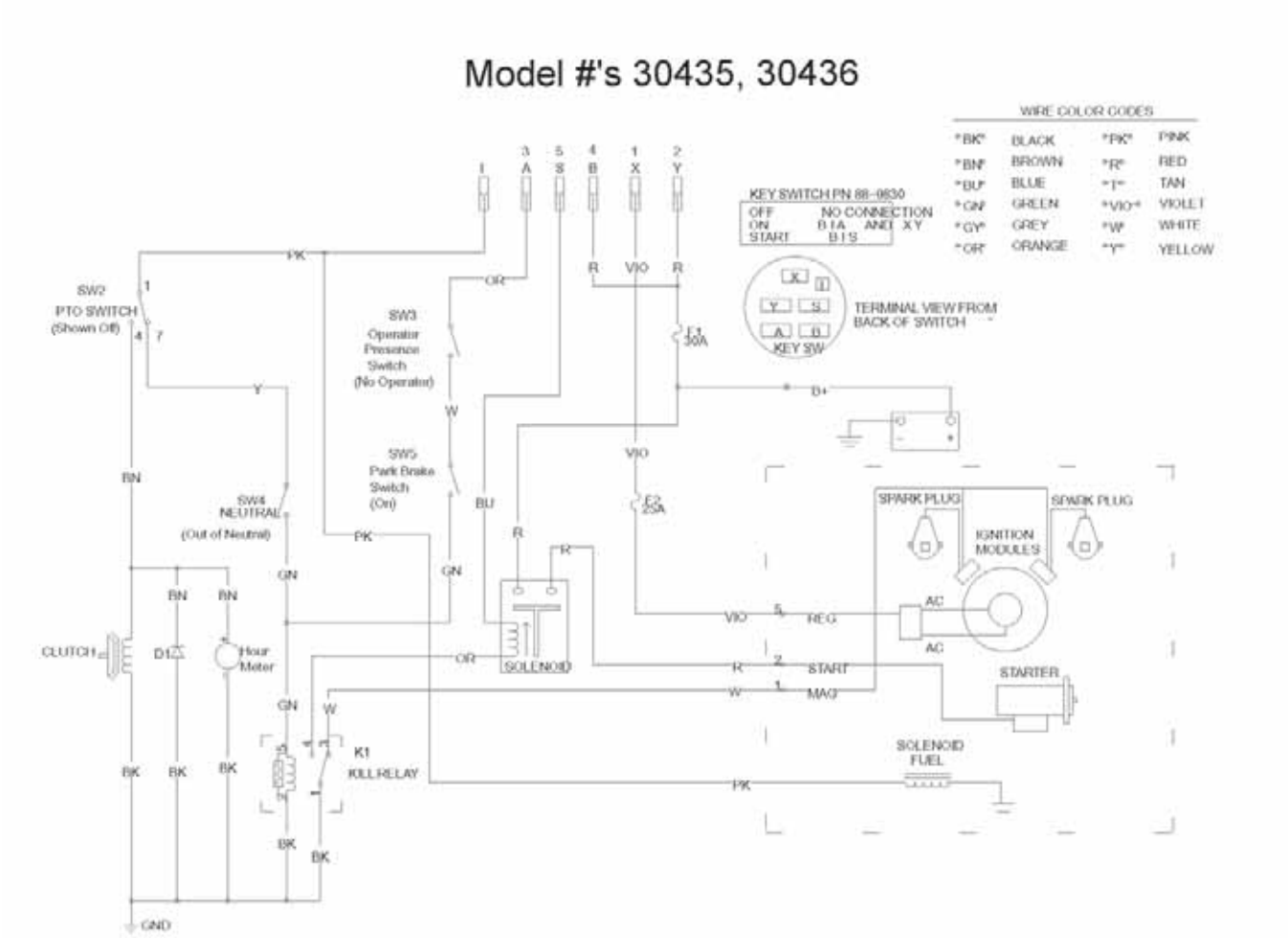
Pistol Grip (Floating Deck - Hydro)



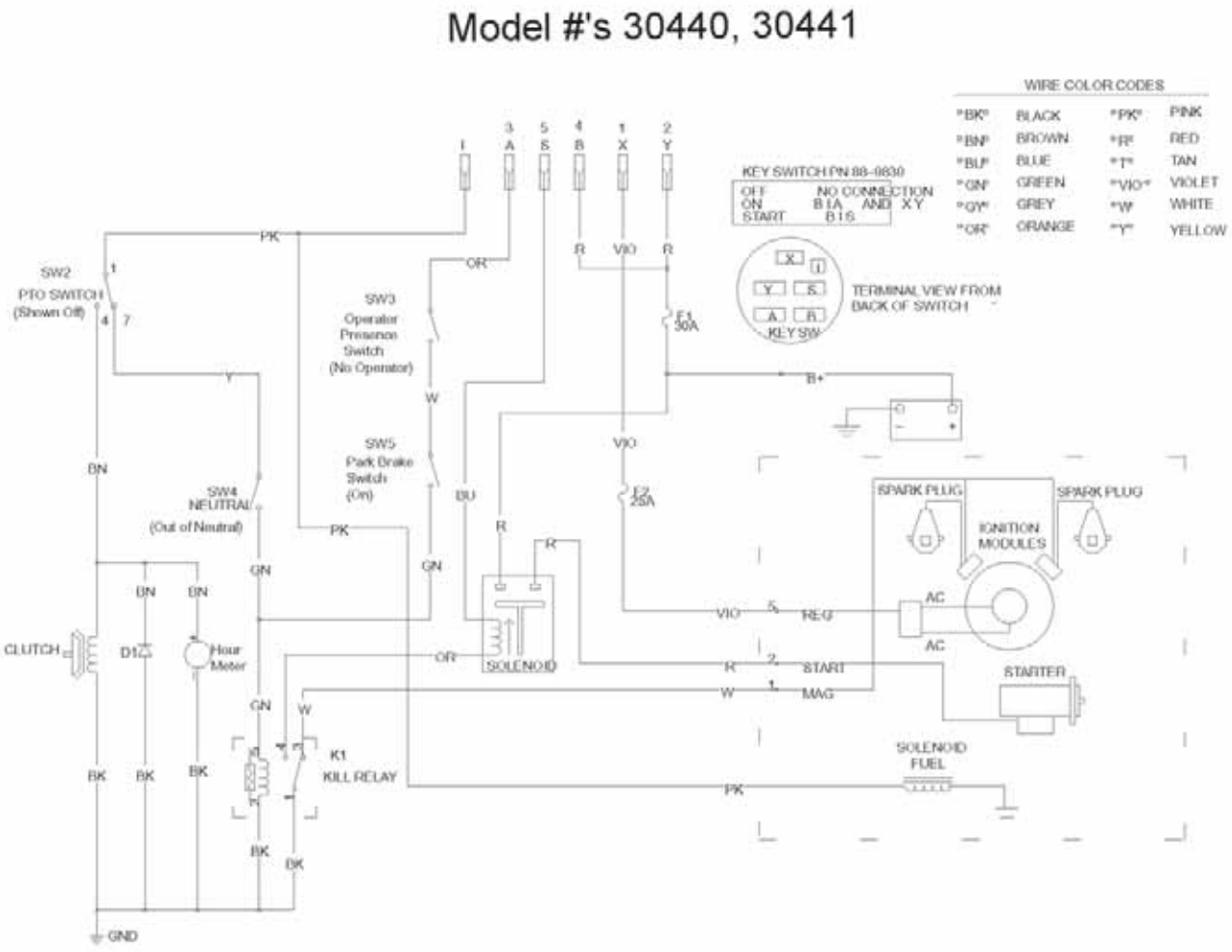
Pistol Grip (Floating Deck - Hydro)



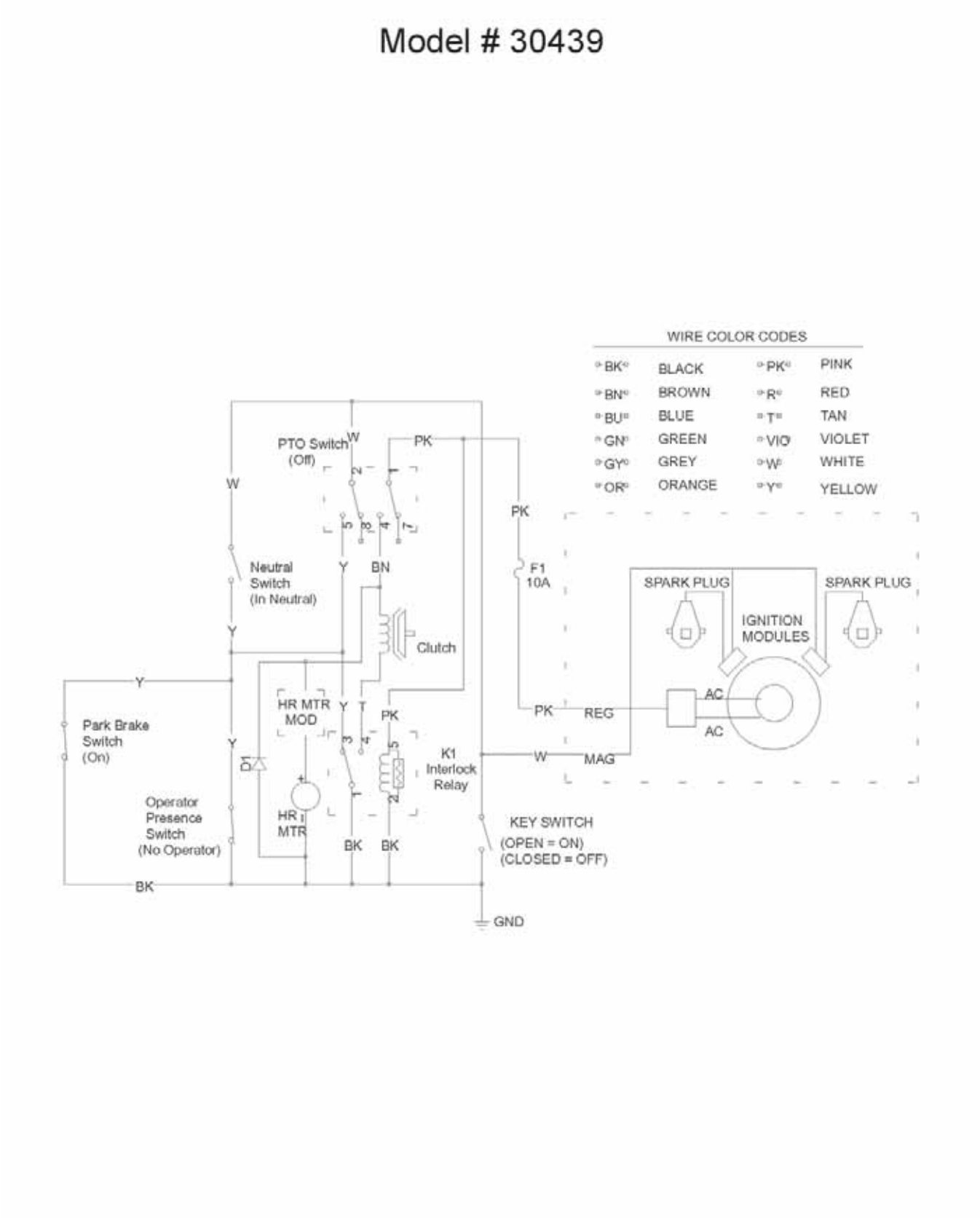
Pistol Grip (Floating Deck - Hydro)



Pistol Grip (Floating Deck - Hydro)



Pistol Grip (Floating Deck - Hydro)



THIS PAGE INTENTIONALLY LEFT BLANK

The Toro Company is a proud supporter of the Equipment & Engine Training Council (EETC)

Please visit www.eetc.org